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## Field-Dependent and Field-Independent Cognitive Styles and Their Educational Implications

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The concepts and methods derived from work on cognitive styles over the past two-and-a-half decades are being applied at an ever increasing rate to research on problems of education. Among the cognitive styles identified to date, the field-dependence-independence dimension has been the most extensively studied and has had the widest application to educational problems (Witkin, Dyk, Faterson, Goodenough, & Karp, 1962/1974; Witkin, Lewis, Hertzman, Machover, Meissner, & Wapner, 1954/1972; Witkin, 1976).<sup>1</sup> While research on educational applications is still in its early stages, the evidence that research has already produced suggests that a cognitive-style approach may be applied with profit to a variety of educational issues. It accordingly seems timely to bring to the attention of educators the concept of cognitive styles in general and the work on field-dependence-independence in particular, which at the mo-

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<sup>1</sup> Comprehensive bibliographies of research on this dimension have recently been provided by Witkin, Oltman, Cox, Ehrlichman, Hamm, and Ringler (Note 1) and by Witkin, Cox, Friedman, Hrishikesan, and Siegel (Note 2).

ment appears to have the clearest implications for educational issues.

The first part of this paper describes the field-dependence-independence dimension in some depth and deals, more generally, with the question of what cognitive styles are. The second part examines four areas in which sufficient research evidence has accumulated from application of the field-dependence-independence concept to identify the potential benefits of a cognitive-style approach for problems of education. These areas are: how students learn; how teachers teach; how teachers and students interact; how students make their educational-vocational choices and perform in the areas of their choice.

### *The Field-Dependent and Field-Independent Styles*

To explain the nature of field-dependence-independence, we describe how work on the dimension evolved. An historical approach has been chosen to emphasize the important point that research on this style, as on most cognitive styles, had its origins in the laboratory and that the concepts and the methods of assessment now in vogue reflect that beginning.

Our earliest work was concerned with how people locate the upright in space (for example, Witkin, 1949, 1950, 1952; Witkin & Asch, 1948). We know which way is up, first of all, on the basis of information we receive from the visual environment around us. A room, for example, is filled with many verticals which correspond to the true upright in space. In addition, we make reference to sensations from within the body, as the body continuously adjusts itself to the downward pull of gravity in maintaining upright posture and balance. Ordinarily, the standard derived from the visual field and the standard derived from the body coincide in direction, and complement each other to give us an accurate sense of the location of the true upright. In our early experiments we eliminated the complex visual world in which we live and substituted for it a simpler, more manipulable visual framework; at the same time we separated the visual and bodily standards.

Figure 1 shows one of several situations we developed, following that strategy. In this situation the substitute visual framework is a luminous square frame presented to the subject in a completely darkened room. The frame can be rotated about its center clockwise or counterclockwise. Pivoted at the same center is a luminous rod which can also be tilted clockwise or counterclockwise, independently of the frame. Frame and rod, presented in tilted positions, are all the subject can see in the darkroom (although more is shown in Figure 1 because of the

- tian University, 1971). *Dissertation Abstracts International*, 1972, 32, 4910B. (University Microfilms No. 72-7617)
- Valinsky, R. E. A study of the relationship between degree of psychological differentiation and reactions to disability (Doctoral dissertation, State University of New York at Buffalo, 1971). *Dissertation Abstracts International*, 1971, 32, 1864B. (University Microfilms No. 71-22,607)
- van Meel-Jansen, A. T. *Kreativiteit en kognitieve stijl*. The Netherlands: Mouton, 1974.
- Vernon, P. E. The distinctiveness of field independence. *Journal of Personality*, 1972, 40, 366-391.
- Wagner, S. R. A descriptive analysis of children's cognitive style: Field articulation and locus of control (Doctoral dissertation, Claremont Graduate School, 1973). *Dissertation Abstracts International*, 1974, 34, 3478B-3479B. (University Microfilms No. 74-984)
- Weissenberg, P., & Gruenfeld, L. W. Relationships among leadership dimensions and cognitive style. *Journal of Applied Psychology*, 1966, 50, 392-395.
- White, B. W. Visual and auditory closure. *Journal of Experimental Psychology*, 1954, 48, 234-240.
- Williams, M. L. Analytical ability, social conformity and *N* influence as a function of temporal and spatial disembedding skill (Doctoral dissertation, Ohio State University, 1969). *Dissertation Abstracts International*, 1970, 30, 3419B. (University Microfilms No. 69-22,230)
- Wineman, J. H. Projected utilization of interpersonal distance as a function of psychological differentiation (Doctoral dissertation, University of Utah, 1973). *Dissertation Abstracts International*, 1974, 34, 5698B-5699B. (University Microfilms No. 74-11,431)
- Witkin, H. A. Perception of body position and of the position of the visual field. *Psychological Monographs*, 1949, 63(1, Whole No. 302).
- Witkin, H. A. Perception of the upright when the direction of the force acting on the body is changed. *Journal of Experimental Psychology*, 1950, 40, 93-106.
- Witkin, H. A. Further studies of perception of the upright when the direction of the force acting on the body is changed. *Journal of Experimental Psychology*, 1952, 43, 9-20.
- Witkin, H. A. A cognitive-style perspective on evaluation and guidance. *Proceedings of the 1973 Invitational Conference on Testing Problems—Measurement for Self-understanding and Personal Development*. Princeton, N. J.: Educational Testing Service, 1974, 21-27.
- Witkin, H. A. Cognitive style in academic performance and in teacher-student relations. In S. Messick (Ed.), *Individuality in learning: Implications of cognitive style and creativity for human development*. San Francisco: Jossey-Bass, 1976.
- Witkin, H. A., & Asch, S. E. Studies in space orientation. IV. Further experiments on perception of the upright with displaced visual fields. *Journal of Experimental Psychology*, 1948, 38, 762-782.
- Witkin, H. A., & Berry, J. W. Psychological differentiation in cross-cultural perspective. *Journal of Cross-Cultural Psychology*, 1975, 6, 4-87.
- Witkin, H. A., Birnbaum, J., Lomonaco, S., Lehr, S., & Herman, J. L. Cognitive patterning in congenitally totally blind children. *Child Development*, 1968, 39, 767-786.
- Witkin, H. A., Dyk, R. B., Faterson, H. F., Goodenough, D. R., & Karp, S. A. *Psychological differentiation*. Potomac, Md.: Erlbaum, 1974. (Originally published Wiley, 1962.)
- Witkin, H. A., Faterson, H. F., Goodenough, D. R., & Birnbaum, J. Cognitive patterning in mildly retarded boys. *Child Development*, 1966, 37, 301-316.
- Witkin, H. A., & Goodenough, D. R. Field dependence and interpersonal behavior. *Psychological Bulletin*, in press.

- Schaefer, S. D. Some cognitive factors influencing interpersonal choice in task situations (Doctoral dissertation, Stanford University, 1973). *Dissertation Abstracts International*, 1973, 34, 2990B. (University Microfilms No. 73-30,470)
- Scheihner, R. M. Field dependence-independence as a basic variable in the measurement of interest and personality (Doctoral dissertation, Temple University, 1969). *Dissertation Abstracts International*, 1970, 30, 3375B-3376B. (University Microfilms No. 69-16,291)
- Schimek, J. G. Cognitive style and defenses: A longitudinal study of intellectualization and field independence. *Journal of Abnormal Psychology*, 1968, 73, 575-580.
- Schmidt, H. E. The identification of high and low creativity in architecture students. *Psychologia Africana*, 1973, 15, 15-40.
- Schwen, T. M. The effect of cognitive styles and instructional sequences on learning a hierarchical task (Doctoral dissertation, Indiana University, 1970). *Dissertation Abstracts International*, 1970, 31, 2797A-2798A. (University Microfilms No. 70-23,380)
- Shapson, S. M. *Hypothesis testing and cognitive style in children*. Unpublished doctoral dissertation, York University, 1973.
- Shavelson, R. J. Methods for examining representations of a subject-matter structure in a student's memory. *Journal of Research in Science Teaching*, 1974, 11, 231-249.
- Shows, W. D. Psychological differentiation and the A-B dimension: A dyadic interaction hypothesis (Doctoral dissertation, Duke University, 1967). *Dissertation Abstracts*, 1968, 28, 3885B. (University Microfilms No. 68-2744)
- Sieben, G. A. *Cognitive style and children's performance on measures of elementary science competencies*. Unpublished master's thesis, University of British Columbia, 1971.
- Solar, D., Davenport, G., & Bruehl, D. Social compliance as a function of field dependence. *Perceptual and Motor Skills*, 1969, 29, 299-306.
- Spitler, G. J. An investigation of various cognitive styles and the implications for mathematics education (Doctoral dissertation, Wayne State University, 1970). *Dissertation Abstracts International*, 1971, 32, 105A. (University Microfilms No. 71-17,317)
- Stasz, C. *Field independence and the structuring of knowledge in a social studies minicourse*. Unpublished master's thesis, Rutgers University, 1974; Stasz, C., Shavelson, R. J., Cox, D. L., & Moore, C. A. *Journal of Educational Psychology*, 1976, 68, 550-558.
- Stein, F. Consistency of cognitive, interest, and personality variables with academic mastery: A study of field-dependence-independence, verbal comprehension, self-perception, and vocational interests in relation to academic performance among male juniors attending an urban university (Doctoral dissertation, New York University, 1968). *Dissertation Abstracts*, 1968, 29, 1429A. (University Microfilms No. 68-11,809)
- Steinfeld, S. L. Level of differentiation and age as predictors of reinforcer effectiveness (Doctoral dissertation, Hofstra University, 1973). *Dissertation Abstracts International*, 1973, 34, 2912B-2913B. (University Microfilms No. 73-25,324)
- Stidham, A. B. A comparative study of factually set and conceptually set college learners (Doctoral dissertation, University of Tennessee, 1966). *Dissertation Abstracts*, 1967, 27, 2899A. (University Microfilms No. 67-1380)
- Swan, G. A. Machiavellianism, impulsivity, field dependence-independence, and performance on the prisoners' dilemma game (Doctoral dissertation, Wayne State University, 1973). *Dissertation Abstracts International*, 1974, 34, 5695B. (University Microfilms No. 74-11,167)
- Trego, R. E. An investigation of the rod and frame test in relation to emotional dependence and social cue attentiveness (Doctoral dissertation, Texas Chris-

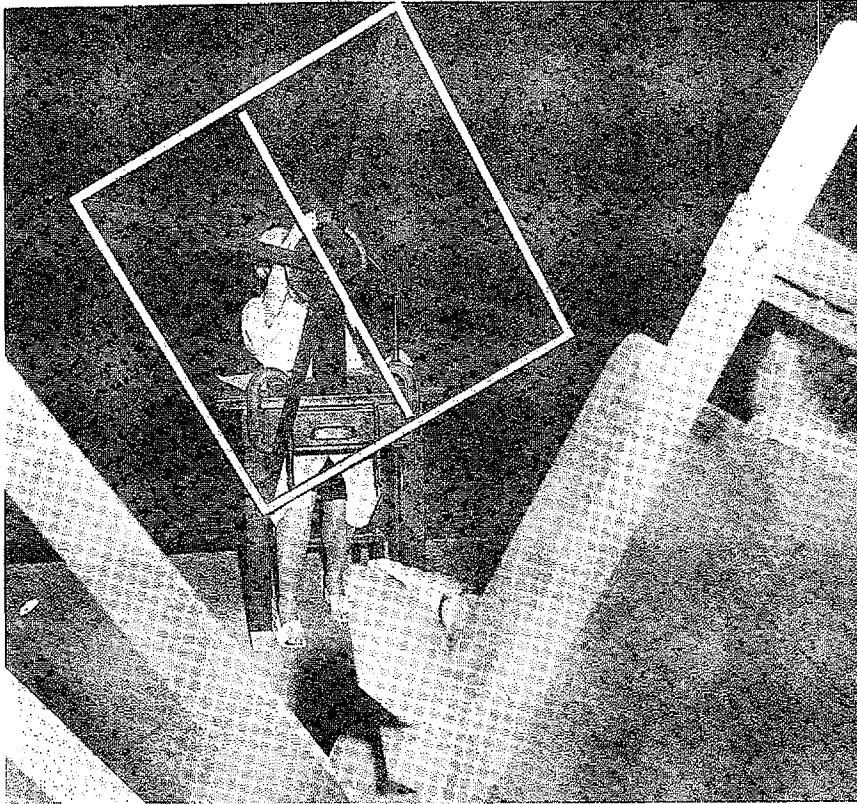


Figure 1. Rod-and-frame test

light needed to take the photograph). The subject's task is to adjust the rod to a position where he perceives it as upright, while the frame around it remains in its initial position of tilt.

Important for the issue of styles was the early finding of marked individual differences among people in how they perform this task. For some, in order for the rod to be apprehended as properly upright, it must be fully aligned with the surrounding frame, whatever the position of the frame. If the frame is tilted  $30^\circ$  to the right, for example, they will tilt the rod  $30^\circ$  to the right, and say the rod is perfectly straight in that position. At the opposite extreme of the continuous performance range are people who adjust the rod more or less close to the upright in making it straight, regardless of the position of the surrounding frame. They evidently apprehend the rod as an entity discrete from the prevailing visual frame of reference and determine the

uprightness of the rod according to the felt position of the body rather than according to the visual frame immediately surrounding it.

Another situation we developed to determine the roles of the visual and bodily standards in perception of the upright is shown in Figure 2. Here, the object of perception is the body, rather than an external object, such as a rod, and the issue is how people determine the position of the body itself in space. The subject is seated in the chair, which can be tilted clockwise or counterclockwise; the chair is projected into the small room which can also be tilted clockwise or counterclockwise, independently of the room. After the subject is seated, the chair and room are brought to prepared tilted settings, and the subject is then asked to adjust the chair to a position where he experiences it as upright. From this account it is not difficult to see that the body-

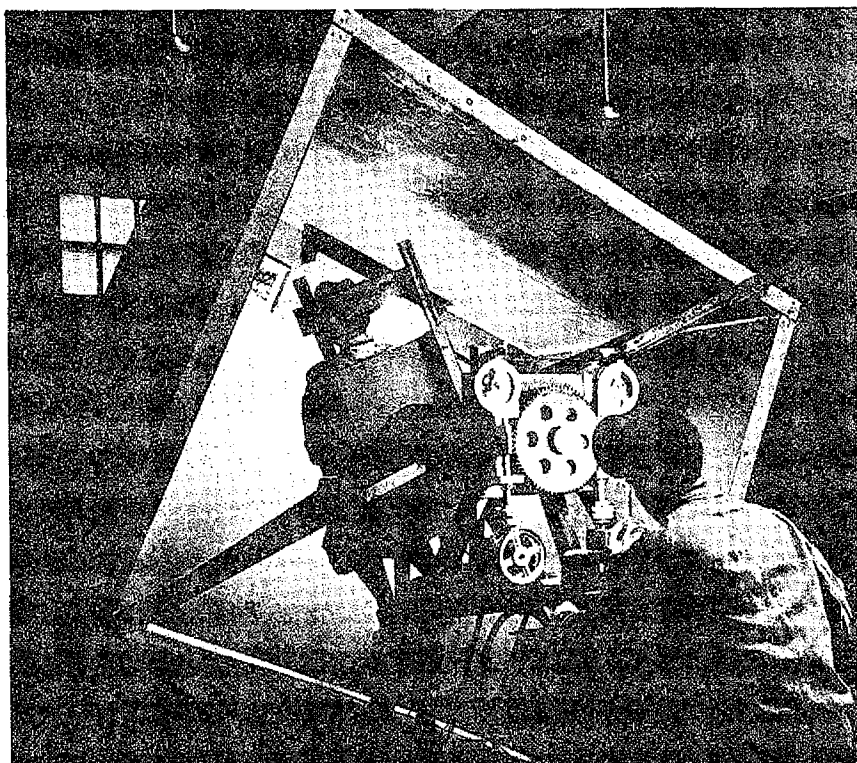


Figure 2. Body-adjustment test

- Paclisanu, M. I. Interacting effects of field-dependence, stimulus deprivation and two types of reinforcement upon problem-solving in elementary school children (Doctoral dissertation, Temple University, 1970). *Dissertation Abstracts International*, 1970, *31*, 2290B-2291B. (University Microfilms No. 70-19,763)
- Paeth, C. A. A Likert scaling of student value statements, field independence-field dependence, and experimentally induced change (Doctoral dissertation, Oregon State University, 1973). *Dissertation Abstracts International*, 1973, *34*, 2288B-2289B. (University Microfilms No. 73-25,368)
- Patrick, T. A. Personality and family background characteristics of women who enter male-dominated professions (Doctoral dissertation, Columbia University, 1973). *Dissertation Abstracts International*, 1973, *34*, 2396A. (University Microfilms No. 73-24,076)
- Pemberton, C. L. The closure factors related to temperament. *Journal of Personality*, 1952, *21*, 159-175.
- Peterson, J. M., & Sweitzer, G. Field-dependent architecture students. *Perceptual and Motor Skills*, 1973, *36*, 195-198.
- Pierson, J. S. Cognitive styles and measured vocational interests of college men (Doctoral dissertation, University of Texas at Austin, 1965). *Dissertation Abstracts*, 1965, *26*, 875-876. (University Microfilms No. 65-8082)
- Pohl, R. L. *An investigation of cognitive styles and their relationship to choice of major and academic performance*. Unpublished bachelor's thesis, Princeton University, 1967.
- Pollack, I. W., & Kiev, A. Spatial orientation and psychotherapy: An experimental study of perception. *Journal of Nervous and Mental Disease*, 1963, *137*, 93-97.
- Quinlan, D. L. Some verbal relationships between field-dependency-independency and relative question structure (Doctoral dissertation, University of Connecticut, 1971). *Dissertation Abstracts International*, 1971, *32*, 2491A-2492A. (University Microfilms No. 71-29,899)
- Quinlan, D. M., & Blatt, S. J. Field articulation and performance under stress: Differential predictions in surgical and psychiatric nursing training. *Journal of Consulting and Clinical Psychology*, 1972, *39*, 517.
- Raab, T. J. An experimental study exploring the relationship between various types of reinforcement, cognitive style and learning among sixth grade students (Doctoral dissertation, Rutgers University, 1973). *Dissertation Abstracts International*, 1974, *34*, 3473B. (University Microfilms No. 73-32,235)
- Randolph, L. C. A study of the effects of praise, criticism and failure on the problem solving performance of field-dependent and field-independent individuals (Doctoral dissertation, New York University, 1971). *Dissertation Abstracts International*, 1971, *32*, 3014B-3015B. (University Microfilms No. 71-28,555)
- Renzi, N. B. A study of some effects of field dependence-independence and feedback on performance achievement (Doctoral dissertation, Hofstra University, 1974). *Dissertation Abstracts International*, 1974, *35*, 2059A. (University Microfilms No. 74-21,861)
- Rosett, H. L., Nackenson, B. L., Robbins, H., & Sapirstein, M. R. Personality and cognitive characteristics of engineering students: Implications for the occupational psychiatrist. *American Journal of Psychiatry*, 1966, *122*, 1147-1152.
- Rosett, H. L., Robbins, H., & Watson, W. S. Physiognomic perception as a cognitive control principle. *Perceptual and Motor Skills*, 1968, *26*, 707-719.
- Ruble, D. N., & Nakamura, C. Y. Task orientation versus social orientation in young children and their attention to relevant social cues. *Child Development*, 1972, *43*, 471-480.
- Rudin, S. A., & Stagner, R. Figure-ground phenomena in the perception of physical and social stimuli. *Journal of Psychology*, 1958, *45*, 213-225.
- Sack, S. A., & Rice, C. E. Selectivity, resistance to distraction and shifting as three attentional factors. *Psychological Reports*, 1974, *34*, 1003-1012.

- McKenna, V. V. Stylistic factors in learning and retention (Doctoral dissertation, Princeton University, 1967). *Dissertation Abstracts*, 1968, 28, 3462B-3463B. (University Microfilms No. 68-2502)
- Messick, S., & Damarin, F. Cognitive styles and memory for faces. *Journal of Abnormal and Social Psychology*, 1964, 69, 313-318.
- Montgomery, D. D. Personality correlates of response tendencies during habituation of the galvanic skin response (Doctoral dissertation, West Virginia University, 1971). *Dissertation Abstracts International*, 1972, 32, 6690B-6691B. (University Microfilms No. 72-14,079)
- Moore, C. A. Styles of teacher behavior under simulated teaching conditions (Doctoral dissertation, Stanford University, 1973). *Dissertation Abstracts International*, 1973, 34, 3149A-3150A. (University Microfilms No. 73-30,449)
- Moore, S. F., Gleser, G. C., & Warm, J. S. Cognitive style in the organization and articulation of ambiguous stimuli. *Psychonomic Science*, 1970, 21, 243-244.
- Nagle, R. M. Personality differences between graduate students in clinical and experimental psychology at varying experience levels (Doctoral dissertation, Michigan State University, 1967). *Dissertation Abstracts*, 1968, 29, 1847B-1848B. (University Microfilms No. 68-11, 081)
- Nebelkopf, E. B., & Dreyer, A. S. Perceptual structuring: Cognitive style differences in the perception of ambiguous stimuli. *Perceptual and Motor Skills*, 1970, 30, 635-639.
- Nebelkopf, E. B., & Dreyer, A. S. Continuous-discontinuous concept attainment as a function of individual differences in cognitive style. *Perceptual and Motor Skills*, 1973, 36, 655-662.
- Nelson, B. A. Effects of the analytic-global and reflectivity-impulsivity cognitive styles on the acquisition of geometry concepts presented through emphasis or no emphasis and discovery or expository lessons (Doctoral dissertation, University of Wisconsin, 1972). *Dissertation Abstracts International*, 1973, 33, 4949A. (University Microfilms No. 72-31,693)
- Nevill, D. D. Experimental manipulation of dependency motivation and its effects on eye contact and measures of field dependency (Doctoral dissertation, University of Florida, 1971). *Dissertation Abstracts International*, 1972, 32, 7295B. (University Microfilms No. 72-16,639)
- Nussbaum, H. Systems and non-systems engineers: An exploratory study of discriminating characteristics (Doctoral dissertation, Wayne State University, 1963). *Dissertation Abstracts*, 1965, 25, 6054-6055. (University Microfilms No. 65-1842)
- Ohnmacht, F. W. Effects of field independence and dogmatism on reversal and nonreversal shifts in concept formation. *Perceptual and Motor Skills*, 1966, 22, 491-497.
- Ohnmacht, F. W. *Relationships among field independence, dogmatism, teacher characteristics and teaching behavior of pre-service teachers*. Paper presented at the meeting of the American Educational Research Association, New York, February 1967. (ERIC Document Reproduction Service No. ED 011 525) (a)
- Ohnmacht, F. W. Teacher characteristics and their relationship to some cognitive styles. *Journal of Educational Research*, 1967, 60, 201-204. (b)
- Ohnmacht, F. W. Factorial invariance of the teacher characteristics schedule and measures of two cognitive styles. *Journal of Psychology*, 1968, 69, 193-199.
- Oltman, P. K. A portable rod-and-frame apparatus. *Perceptual and Motor Skills*, 1968, 26, 503-506.
- Oltman, P. K., Goodenough, D. R., Witkin, H. A., Freedman, N., & Friedman, F. Psychological differentiation as a factor in conflict resolution. *Journal of Personality and Social Psychology*, 1975, 32, 730-736.
- Osipow, S. H. Cognitive styles and educational-vocational preferences and selection. *Journal of Counseling Psychology*, 1969, 16, 534-546.



adjustment situation and the rod-and-frame situation are in fact structurally similar. In each there is an item—rod or body—surrounded by a visual field—frame or room—and the question is to what extent perception of the item is determined by the surrounding framework.

Individual differences in performance in the body-adjustment situation are very similar to those described for the rod-and-frame situation. There are some people who perceive their own bodies as upright when they are fully aligned with the surrounding tilted room. It may be astounding that someone can be tilted as much as 35 degrees, and, if in that position he is aligned with the room, tilted at the same angle, he will report that he is perfectly straight, that "this is the way I sit when I eat my dinner," "this is the way I sit in class." At the other extreme of the performance range we find people who, regardless of the position of the surrounding room, bring the body more or less to the upright. They seem able to apprehend the body as an entity discrete from the surrounding field, which, in people at the other extreme, exerts a profound effect on their perception of body position. Here again most people fall between the two extremes just described.

We may interpolate here that everyone is very accurate when the same task of straightening the body is conducted with eyes closed. The individual differences we have been considering are thus clearly the consequence of the conflict created between the standard of uprightness derived from the surrounding field and the standard derived from within the body.

The early work on field-dependence-independence made use of a third situation, shown in Figure 3. Although it does not involve perception of the upright or the body, it is actually quite similar to the rod-and-frame and body-adjustment situations in its essential perceptual structure. In this embedded-figures situation,

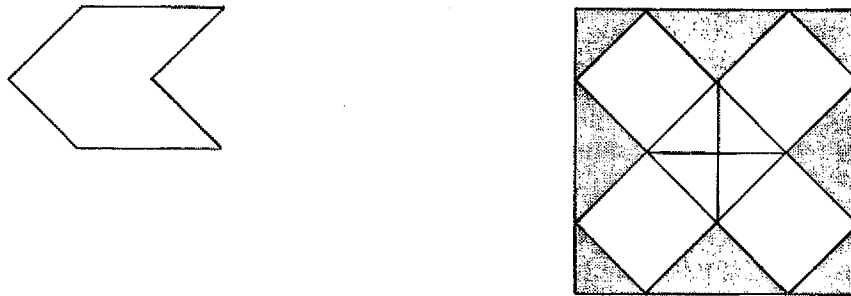


Figure 3. Sample of simple and complex figures similar to those used in the Embedded-Figures Test.

the subject is shown the simple figure on the left; it is then removed and he is shown the complex figure on the right, with the directive to locate the simple figure within it. What has been done in composing the complex figure is to "use up" the lines of the simple figure in various subwholes of the complex figure, so that perceptually, the simple figure no longer appears to be there. Describing the situation in these terms makes evident its similarity to the two space-orientation situations. Here, too, the subject is presented with an item—now a simple geometric design rather than a rod or the body—which is contained within a complex organized field—now a complex design rather than a frame or room—and, once more, what is at issue is the extent to which the surrounding visual framework dominates perception of the item within it. Again, individual differences in performance are very marked, and they are similar in nature to those described for the first two tasks. For people at one extreme the sought-after simple figure quickly emerges from the complex design, whereas people at the other extreme are not able to identify the simple figure in the time allowed for search.

In all three situations considered we come out with a quantitative indicator of the extent to which the surrounding organized field has influenced the person's perception of an item within it. In the first two situations the subject's score is the amount of tilt of rod or body, in degrees, when these items are reported to be straight. In the embedded-figures situation the score is the time taken to locate the simple figure in the complex design.

Now of importance for the issue of cognitive styles is the evidence of self-consistency in performance across tasks. If the same person is tested in the situations we have been examining, it is found that the person who tilts the rod far toward the tilted frame in making it straight is likely to be the person who tilts his body far toward the tilted room to perceive the body as upright, and he is also likely to be the person who takes a long time to find the simple figure in the complex design. This kind of self-consistency has been found to extend across tasks involving sense modalities other than those featured in the three tasks we have examined—including, for example, an auditory embedded-figures task, where a simple tune must be located in a complex melody, and a tactile embedded-figures task, where, with eyes closed, a felt-out simple figure, composed of raised contours, must be identified in a complex figure, similarly composed of raised contours (Axelrod & Cohen, 1961; White, 1954; Witkin, Birnbaum, Lomonaco, Lehr, & Herman, 1968).

As must be evident from the descriptions given, the common denominator underlying individual differences in performance in these various tasks is the extent to which the person perceives

- Kennedy, R. S. The relationship between habituation to vestibular stimulation and vigilance: Individual differences and subsidiary problems (Doctoral dissertation, University of Rochester, 1972). *Dissertation Abstracts International*, 1972, 33, 2374B-2375B. (University Microfilms No. 72-28,764)
- Kirschenbaum, J. Analytic-global cognitive style and concept attainment strategies (Doctoral dissertation, Claremont Graduate School, 1968). *Dissertation Abstracts International*, 1969, 29, 4868B-4869B. (University Microfilms No. 68-18,276)
- Klein, C. M. Creativity and incidental learning as functions of cognitive control of attention deployment (Doctoral dissertation, Wayne State University, 1963). *Dissertation Abstracts*, 1968, 28, 4747B-4748B. (University Microfilms No. 68-6655)
- Kleine, P. F. An analysis of cognitive and psychological differentiation in perceptual and impression formation tasks (Doctoral dissertation, Washington University, 1967). *Dissertation Abstracts*, 1968, 28, 4002A. (University Microfilms No. 68-5141)
- Konstadt, N., & Forman, E. Field dependence and external directedness. *Journal of Personality and Social Psychology*, 1965, 1, 490-493.
- Koran, M. L., Snow, R. E., & McDonald, F. J. Teacher aptitude and observational learning of a teaching skill. *Journal of Educational Psychology*, 1971, 62, 219-228.
- Levy, S. *Field independence-field dependence and occupational interests*. Unpublished master's thesis, Cornell University, 1969.
- Linton, H. B. *Relations between mode of perception and the tendency to conform*. Unpublished doctoral dissertation, Yale University, 1952.
- MacKinnon, D. W. The personality correlates of creativity: A study of American architects. In G. Nielson (Ed.), *Proceedings of the XIV International Congress of Applied Psychology*. (Vol. 2) *Personality Research*. Copenhagen, Denmark: Munksgaard, 1962.
- Manning, T. T. *The relation of field-dependence-independence to expressed and inventoried career motivation in women*. Unpublished master's thesis, The Catholic University of America, 1969.
- Manning, T. T. Career motivation, ego development and self-actualization in adult women (Doctoral dissertation, The Catholic University of America, 1973). *Dissertation Abstracts International*, 1974, 35, 5657B. (University Microfilms No. 74-9899)
- Marcus, E. S. The relationship of psychological differentiation to the congruence of temporal patterns of speech (Doctoral dissertation, New York University, 1970). *Dissertation Abstracts International*, 1970, 31, 2288B. (University Microfilms No. 70-19,016)
- Margulis, M. Perceptual and cognitive correlates of self-actualization (Doctoral dissertation, University of Maine, 1971). *Dissertation Abstracts International*, 1972, 32, 6055B-6056B. (University Microfilms No. 72-5628)
- Mayer, A. D. Preferences in level of conceptualization as related to motor inhibition and field dependence (Doctoral dissertation, Columbia University, 1967). *Dissertation Abstracts*, 1967, 28, 2628B. (University Microfilms No. 67-15,501)
- Mayo, P. R., & Bell, J. M. A note on the taxonomy of Witkin's field-independence measures. *British Journal of Psychology*, 1972, 63, 255-256.
- McCaulley, M. H. Dimensions of masculinity-femininity in relation to field dependence, dogmatism, and other estimates of perceptual-cognitive differentiation (Doctoral dissertation, Temple University, 1964). *Dissertation Abstracts*, 1965, 25, 4259. (University Microfilms No. 64-9340)
- McFall, R. M., & Schenkein, D. Experimenter expectancy effects, need for achievement, and field dependence. *Journal of Experimental Research in Personality*, 1970, 4, 122-128.

- sertation Abstracts International*, 1971, 31, 7571B-7572B (University Microfilms No. 71-13,645)
- Greenfield, N. L. *Field independence-dependence and bargaining behavior*. Unpublished master's thesis, Cornell University, 1969.
- Greenwald, E. R. Perceptual style in relation to role choices and motivational variables (Doctoral dissertation, Yeshiva University, 1968). *Dissertation Abstracts International*, 1968, 29, 2192B. (University Microfilms No. 68-17,167)
- Grippin, P. C. Field independence and reflection-impulsivity as mediators of performance on a programmed learning task with and without strong prompts (Doctoral dissertation, State University of New York at Albany, 1972). *Dissertation Abstracts International*, 1973, 34, 2387A-2388A. (University Microfilms No. 73-19,674)
- Heath, R. W. Curriculum, cognition, and educational measurement. *Educational and Psychological Measurement*, 1964, 24, 239-253.
- Holley, M. Field-dependence-independence, sophistication-of-body-concept, and social distance selection (Doctoral dissertation, New York University, 1972). *Dissertation Abstracts International*, 1972, 33, 296B. (University Microfilms No. 72-20,635)
- Holtzman, W. H., Swartz, J. D., & Thorpe, J. S. Artists, architects, and engineers—three contrasting modes of visual experience and their psychological correlates. *Journal of Personality*, 1971, 39, 432-449.
- Hudson, L. *Contrary imaginations: A psychological study of the young student*. New York: Schocken, 1966.
- Hunt, D., & Randhawa, B. S. Relationship between and among cognitive variables and achievement in computational science. *Educational and Psychological Measurement*, 1973, 33, 921-928.
- Ihilevich, D., & Gleser, G. C. Relationship of defense mechanisms to field dependence-independence. *Journal of Abnormal Psychology*, 1971, 77, 296-302.
- Iman, A. Incidental learning: IV—A function of field dependence. *Pakistan Journal of Psychology*, December 1973, 7-23.
- James, C. D. R. *A cognitive style approach to teacher-pupil interaction and the academic performance of black children*. Unpublished master's thesis, Rutgers University, 1973.
- Jay, R. L. *The relation between some perceptual factors and some personality categories*. Unpublished master's thesis, University of Chicago, 1950.
- Jennings, B. S. Some cognitive control variables and psycholinguistic dimensions (Doctoral dissertation, University of Florida, 1967). *Dissertation Abstracts*, 1968, 29, 1172B-1173B. (University Microfilms No. 68-13,011)
- Johnson, P. E. On the communication of concepts in science. *Journal of Educational Psychology*, 1969, 60, 32-40.
- Justice, M. T. Field dependency, intimacy of topic and interperson distance (Doctoral dissertation, University of Florida, 1969). *Dissertation Abstracts International*, 1970, 31, 395B-396B. (University Microfilms No. 70-12,243)
- Kagan, J., Rosman, B. L., Day, D., Albert, J., & Phillips, W. Information processing in the child: Significance of analytic and reflective attitudes. *Psychological Monographs: General and Applied*, 1964, 78(1, Whole No. 578).
- Kangas, B. B. An experimental manipulation of expressed values (Doctoral dissertation, Washington State University, 1970). *Dissertation Abstracts International*, 1971, 31, 4997B. (University Microfilms No. 71-4403)
- Karp, S. A. Field dependence and overcoming embeddedness. *Journal of Consulting Psychology*, 1963, 27, 294-302.
- Karp, S. A., Kissin, B., & Hustmyer, F. E. Field dependence as a predictor of alcoholic therapy dropouts. *Journal of Nervous and Mental Disease*, 1970, 150, 77-83.
- Keen, P. G. W. The implications of cognitive style for individual decision-making (Doctoral dissertation, Harvard University, 1973). *Dissertation Abstracts International*, 1974, 34, 5238B. (University Microfilms No. 74-9036)

part of a field as discrete from the surrounding field as a whole, rather than embedded in the field; or the extent to which the organization of the prevailing field determines perception of its components; or, to put it in everyday terminology, the extent to which the person perceives analytically.<sup>2</sup> Because at one extreme of the performance range perception is strongly dominated by the prevailing field, that mode of perception was designated "field dependent." At the other extreme, where the person experiences items as more or less separate from the surrounding field, the designation "field independent" was used. Because scores from any test of field-dependence-independence form a continuous distribution, these labels reflect a tendency, in varying degrees of strength, toward one mode of perception or the other. There is no implication that there exist two distinct types of human beings.

People are likely to be quite stable in their preferred mode of perceiving, even over many years (for example, Bauman, 1951; Faterson & Witkin, 1970; Witkin, Goodenough, & Karp, 1967). Furthermore, in Western societies there are small but persistent sex differences in field-dependence-independence, beginning in adolescence. Women, on the average, tend to be more field dependent than men. It should be stressed, however, that the difference in means between the sexes is quite small compared to the range of scores within each sex; in other words, the distributions for the two sexes show considerable overlap. Evidence from recent cross-cultural studies that sex differences in field-dependence-independence may be uncommon in mobile, hunting societies and prevalent in sedentary, agricultural societies—societies which are characteristically different in sex-role training and in the value attached to women's roles in the economy—points up the important role of socialization in the development of sex differences in field-dependence-independence (Witkin & Berry, 1975; Stewart, Note 3).

In place of the rather complex gadgets required for some of the early laboratory tests of field-dependence-independence there are now available simpler devices and even group tests; and there are tests which, among them, are applicable to the entire age span, from the preschool period onward. For example, there has been developed a small table-top model of the rod-and-frame apparatus, which can easily be transported to where there are

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<sup>2</sup> Several studies have shown that the presence of an organized field, which must be "broken up" in order to identify the sought-after item, is an essential feature of tasks which tap this dimension. Thus, tasks of this kind have been found to load a different factor than tasks in which the field from which the item must be extracted has no inherent organization and so serves merely as a distraction to the subject in his search for the item (for example, Karp, 1963; Sack & Rice, 1974).

subjects to be tested and which makes a darkroom unnecessary (Oltman, 1968). There are also now available preschool (for ages 3-5) and children's (for ages 5-9) forms of the embedded-figures test, as well as a group form of the embedded-figures test for adults (see Coates, 1972; Witkin, Oltman, Raskin, & Karp, 1971). These tests have been shown to have good reliability.

Thus far we have been examining the ways in which people deal with an immediately present stimulus configuration, in other words, how they perceive. Extensive evidence, accumulated over the years, shows that the styles we first identified in perception manifest themselves as well when the person is dealing with symbolic representations, as in thinking and problem solving. The individual, who, in perception, cannot keep an item separate from the surrounding field—in other words, who is relatively field dependent—is likely to have difficulty with that class of problems, and, we must emphasize, *only* with that class of problems, where the solution depends on taking some critical element out of the context in which it is presented and restructuring the problem material so that the item is now used in a different context.

An example of such a situation is provided by an unpublished study of Frances Harris (Note 4), who used two of the problem-solving tasks employed by Duncker (1945) in his classical studies of functional fixity. To illustrate, in one of these the subject is required to construct a stand (or shelf) consisting of a board resting on two supports. The experimenter, in fact, makes available the items required for such a structure; in the experimental room there are, among other objects, a board, one support, and a pair of pliers. The support is nailed to the board by the experimenter in such a way that if the subject is to use the support as part of the stand he must first remove the nail. To carry out this task the subject has to use the pliers in its conventional function. However, to construct the shelf the pliers also has to be used as the second support for the shelf. Obviously, for the pliers to be used as a support, it must be "taken out of" its conventional functional context and conceived of in its less commonplace context of serving as a support. Here, as in the perceptual tasks we considered earlier, what is at issue is the degree of adherence to a predominant context. Harris found that, to a striking degree, people who were field independent in laboratory tests of perception more easily overcame the predominant context in the pliers problem.

It is clear from this and other evidence that the individual-differences dimension first picked up in perception shows itself equally in the problem-solving domain.

A next research step further enlarged the scope of the dimen-

- Mississippi, 1971). *Dissertation Abstracts International*, 1971, 32, 3028B-3029B. (University Microfilms No. 71-28,831)
- Fitz, R. J. The differential effects of praise and censure on serial learning as dependent on locus of control and field dependency (Doctoral dissertation, Catholic University of America, 1970). *Dissertation Abstracts International*, 1971, 31, 4310B. (University Microfilms No. 71-1457)
- Fitzgibbons, D. J., & Goldberger, L. Task and social orientation: A study of field dependence, "arousal," and memory for incidental material. *Perceptual and Motor Skills*, 1971, 32, 167-174.
- Fitzgibbons, D., Goldberger, L., & Eagle, M. Field dependence and memory for incidental material. *Perceptual and Motor Skills*, 1965, 21, 743-749.
- Fleming, M. L., Knowlton, J. Q., Blain, B. B., Levie, W. H., & Elerian, A. *Message design: The temporal dimension of message structure. Final Report*. Bloomington, Indiana: Indiana University, 1968. (ERIC Document Reproduction Service No. ED 023 294)
- Folman, R. Z. Therapist-patient perceptual style, interpersonal attraction, initial interview behavior, and premature termination (Doctoral dissertation, Boston University, 1973). *Dissertation Abstracts International*, 1973, 34, 1746B. (University Microfilms No. 73-23,482)
- Frederick, W. C. Information processing and concept learning at grades six, eight, and ten as a function of cognitive style (Doctoral dissertation, University of Wisconsin, 1967). *Dissertation Abstracts*, 1968, 28, 4478A. (University Microfilms No. 68-1082)
- Freedman, N., O'Hanlon, J., Oltman, P., & Witkin, H. A. The imprint of psychological differentiation on kinetic behavior in varying communicative contexts. *Journal of Abnormal Psychology*, 1972, 79, 239-258.
- Gehlmann, F. *Performance on objective tests as indicators of temperament and other personality traits*. Unpublished doctoral dissertation, University of Chicago, 1951.
- Glass, G. G. Rate of reading: A correlation and treatment study. *Journal of Reading*, 1967, 11, 168-178.
- Glatt, C. J. W. The relationship of level of differentiation, acceptance of authority and locus of control to readiness for vocational planning in eighth grade boys (Doctoral dissertation, New York University, 1970). *Dissertation Abstracts International*, 1970, 31, 2179A. (University Microfilms No. 70-21,132)
- Goldberger, L., & Bendich, S. Field-dependence and social responsiveness as determinants of spontaneously produced words. *Perceptual and Motor Skills*, 1972, 34, 883-886.
- Goldman, R., & Warren, R. Discriminant analysis of study strategies connected with college grade success in different major fields. *Journal of Educational Measurement*, 1973, 10, 39-47.
- Goodenough, D. R. The role of individual differences in field dependence as a factor in learning and memory. *Psychological Bulletin*, 1976, 83, 675-694.
- Goodenough, D. R. & Karp, S. A. Field dependence and intellectual functioning. *Journal of Abnormal and Social Psychology*, 1961, 63, 241-246.
- Greene, L. R. Effects of field independence, physical proximity and evaluative feedback on affective reactions and compliance in a dyadic interaction (Doctoral dissertation, Yale University, 1973). *Dissertation Abstracts International*, 1973, 34, 2284B-2285B. (University Microfilms No. 73-26,285); *Journal of Personality and Social Psychology*, 1976, 34, 569-577.
- Greene, M. A. Client perception of the relationship as a function of worker-client cognitive styles (Doctoral dissertation, Columbia University, 1972). *Dissertation Abstracts International*, 1972, 33, 3030A-3031A. (University Microfilms No. 72-31,213)
- Greenfield, A. Perceptual style, attitudes toward problem solving, and problem-solving performance (Doctoral dissertation, New York University, 1970). *Dis-*

- DeRussy, E. A., & Futch, E. Field dependence-independence as related to college curricula. *Perceptual and Motor Skills*, 1971, 33, 1235-1237.
- Dickie, K. E. Effects of compressing visual information and field-dependence on acquiring a procedural skill (Doctoral dissertation, Indiana University, 1969). *Dissertation Abstracts International*, 1970, 31, 662A. (University Microfilms No. 70-11,683)
- Dickstein, L. S. Field independence in concept attainment. *Perceptual and Motor Skills*, 1968, 27, 635-642.
- Dingman, R. L. A study of cognitive style differences as a factor of communications in school counseling (Doctoral dissertation, Wayne State University, 1971). *Dissertation Abstracts International*, 1972, 32, 6756A. (University Microfilms No. 72-14,544)
- DiStefano, J. J. Interpersonal perceptions of field independent and field dependent teachers and students (Doctoral dissertation, Cornell University, 1969). *Dissertation Abstracts International*, 1970, 31, 463A-464A. (University Microfilms No. 70-11,225)
- Doob, L. W. Behavior and grammatical style. *Journal of Abnormal and Social Psychology*, 1958, 56, 398-400.
- Dubois, T. E., & Cohen, W. Relationship between measures of psychological differentiation and intellectual ability. *Perceptual and Motor Skills*, 1970, 31, 411-416.
- Dunker, K. On problem-solving (L. S. Lees, Trans.). *Psychological Monographs*, 1945, 58(5 Whole No. 270).
- Duvall, N. S. Field articulation and the repression-sensitization dimension in perception and memory (Doctoral dissertation, University of North Carolina at Chapel Hill, 1969). *Dissertation Abstracts International*, 1970, 30, 3864B. (University Microfilms No. 70-3228)
- Eagle, M., Fitzgibbons, D., & Goldberger, L. Field dependence and memory for relevant and irrelevant incidental stimuli. *Perceptual and Motor Skills*, 1966, 23, 1035-1038.
- Eagle, M., Goldberger, L., & Breitman, M. Field dependence and memory for social vs. neutral and relevant vs. irrelevant incidental stimuli. *Perceptual and Motor Skills*, 1969, 29, 903-910.
- Engelhardt, J. M. The relationship between a dimension of cognitive style and the teaching behavior of prospective elementary teachers of mathematics (Doctoral dissertation, University of Texas at Austin, 1972). *Dissertation Abstracts International*, 1973, 33, 4934A. (University Microfilms No. 73-7548)
- Erginel, A. The relation of cognitive style and intelligence to achievement and errors in thinking (Doctoral dissertation, Lehigh University, 1969). *Dissertation Abstracts International*, 1970, 31, 216A-217A. (University Microfilms No. 70-1719)
- Evans, J. R. Relationships of psychological differentiation, emotional distance from reinforcing agent, emotional arousal, and responsiveness to social reinforcement (Doctoral dissertation, George Peabody College for Teachers, 1969). *Dissertation Abstracts International*, 1970, 31, 411B-412B. (University Microfilms No. 70-10,902)
- Farr, R. S. Personality variables and problem solving performance: An investigation of the relationships between field-dependence-independence, sex-role identification, problem difficulty and problem solving performance (Doctoral dissertation, New York University, 1968). *Dissertation Abstracts*, 1969, 29, 2561A-2562A. (University Microfilms No. 69-3168)
- Faterson, H. F., & Witkin, H. A. Longitudinal study of development of the body concept. *Developmental Psychology*, 1970, 2, 429-438.
- Ferrell, J. G. The differential performance of lower class, preschool, Negro children as a function of the sex of E, sex of S, reinforcement condition, and the level of field dependence (Doctoral dissertation, University of Southern



sion. As we have seen, a relatively field-independent person is likely to overcome the organization of the field, or to restructure it, when presented with a field having a dominant organization, whereas the relatively field-dependent person tends to adhere to the organization of the field as given. This characteristic difference in manner of approaching the field also showed itself under circumstances where the field lacks inherent organization—for example, Rorschach inkblots. In the great preponderance of studies performed on this issue relatively field-independent persons have been found more likely to impose structure spontaneously on stimulus material which lacks it, whereas relatively field-dependent persons were here again likely to leave the material “as is” (for example, Moore, Gleser, & Warm, 1970; Nebelkopf & Dreyer, 1970; Witkin et al., 1962/1974).

It is noteworthy that this difference in propensity toward imposing structure when it is lacking is not limited to straightforwardly perceptual material, such as Rorschach inkblots or ambiguous stimuli. It has been found in studies with verbal materials as well (Bruce, 1965; Kleine, 1967; Stasz, 1974). In the study by Stasz (1974), for example, structuring of curricular content by field-dependent and field-independent high school teachers and their students was examined in a social-studies minicourse. Some content areas, such as mathematics and natural science, have a content structure in which many concepts are functionally related to each other (Johnson, 1969; Shavelson, 1974). However, in the area of social studies such a content structure is less clear, leaving the organization of concepts to the individual. In the Stasz study psychological structuring was inferred from subjects' ratings of similarity among 10 general anthropological concepts, such as “culture,” “society,” and “civilization.” Both before and after minicourse instruction field-dependent teachers and students made fewer distinctions among concepts. For field-dependent teachers and students, concepts clustered into a large, loosely organized group which included most of the concepts. For field-independent teachers and students, concepts clustered into small, tight groups with less overlap across groups.<sup>3</sup>

The evidence linking structuring tendencies to analytical tendencies (of the kind involved in field-dependence-independence) suggested that the individual differences with which we were dealing might best be conceived as an articulated-global continuum. Analyses and structuring are complementary aspects of

<sup>3</sup> In a later section, “How children learn,” we will examine studies which consider the consequences for learning of this difference between relatively field-dependent and field-independent children in tendency to structure, or, as we shall designate it there, in the tendency to use organizational mediators.

articulation. The person who experiences in an articulated fashion tends to perceive items as discrete from background, when the field is organized, and to impose structure on a field, and so perceive it as organized, when the field has relatively little inherent structure. In contrast, it may be said that experience is more global when it accords with the overall character of the prevailing field as given, and involves less intervention of mediators, such as analysis and structuring. The articulated-global concept is applicable to the processing of information both from an immediately present stimulus configuration, as in perception, or from symbolic material, as in intellectual functioning.

From such evidence it became clear that we were dealing with a broad dimension of individual differences that extends across both perceptual and intellectual activities. Because what is at issue is the characteristic approach the person brings with him to a wide range of situations—we called it his “style”—and because the approach encompasses both his perceptual and intellectual activities—we spoke of it as his “cognitive” style.

The picture of self-consistency thus far described was subsequently extended by the demonstration that the individual modes of functioning earlier identified as cutting across the perceptual and intellectual domains extend into other domains, traditionally subsumed under “personality.”

Particularly impressive is the evidence of differences in characteristics falling in the domain of social behavior between people with a relatively articulated or relatively global cognitive style. Taken collectively, the social characteristics that distinguish persons with contrasting styles suggest that relatively field-dependent persons, in contrast to more field-independent ones, are likely to be attentive to and make use of prevailing social frames of reference, just as in the perceptual situations we considered earlier they were found to rely on the prevailing perceptual frame of reference (Witkin & Goodenough, in press).

On the side of attentiveness to social cues, impressive evidence from many studies, using a variety of approaches and procedures, indicates that field-dependent persons have what in effect amounts to a sensitive radar system, selectively attuned to social components of the environment. This tendency shows itself in many social modalities. Thus, it has been demonstrated that relatively field-dependent persons, more than field-independent ones, literally look more at the faces of others, the primary source of information about what others are feeling and thinking (for example, Konstadt & Forman, 1965; Nevill, 1972; Ruble & Nakamura, 1972). The selective interest of relatively field-dependent persons in social aspects of the surround is not limited to faces. There are studies which suggest (although the evidence

- Barrett, G. V., & Thornton, C. L. Cognitive style differences between engineers and college students. *Perceptual and Motor Skills*, 1967, 25, 789-793.
- Bauman, G. *The stability of the individual's mode of perception, and of perception-personality relationships*. Unpublished doctoral dissertation, New York University, 1951.
- Beck, R. C. Performance of introverts and extraverts on various tests of cognitive control (Doctoral dissertation, Texas Tech University, 1970). *Dissertation Abstracts International*, 1971, 31, 6251B-6252B. (University Microfilms No. 71-9621)
- Beijk-Docter, M. A., & Elshout, J. J. Veldafhankel ijkheid en geheugen met betrekking tot sociaal relevant en sociaal niet-relevant materiaal. *Nederlands Tijdschrift Voor de Psychologie en Haar Grensgebieden*, 1969, 24, 267-279.
- Bieri, J., Bradburn, W. M., & Galinsky, M. D. Sex differences in perceptual behavior. *Journal of Personality*, 1958, 26, 1-12.
- Biggs, J. B., Fitzgerald, D., & Atkinson, S. M. Convergent and divergent abilities in children and teachers' ratings of competence and certain classroom behaviors. *British Journal of Educational Psychology*, 1971, 41, 277-286.
- Bogo, N., Winget, C., & Gleser, G. C. Ego defenses and perceptual styles. *Perceptual and Motor Skills*, 1970, 30, 599-605.
- Braun, J. A. The empathic ability of psychotherapists as related to therapist perceptual flexibility and professional experience, patient insight, and therapist-patient similarity (Doctoral dissertation, Fordham University, 1971). *Dissertation Abstracts International*, 1971, 32, 2391B-2392B. (University Microfilms No. 71-26,956)
- Bruce, D. K. The effect of field dependence and anxiety on the perception of social stimuli (Doctoral dissertation, University of Utah, 1965). *Dissertation Abstracts*, 1965, 26, 3475-3476. (University Microfilms No. 65-12,544)
- Bruner, J. S., Goodnow, J. J., & Austin, G. A. *A study of thinking*. New York: Wiley, 1956.
- Chung, W. S. Relationships among measures of cognitive style, vocational preferences, and vocational identification (Doctoral dissertation, George Peabody College for Teachers, 1966). *Dissertation Abstracts*, 1967, 27, 4110B-4111B. (University Microfilms No. 67-3611)
- Clar, P. N. The relationship of psychological differentiation to client behavior in vocational choice counseling (Doctoral dissertation, University of Michigan, 1971). *Dissertation Abstracts International*, 1971, 32, 1837B. (University Microfilms No. 71-23,723)
- Cline, V. B., Richards, J. M., & Abe, C. The validity of a battery of creativity tests in a high school sample. *Educational and Psychological Measurement*, 1962, 22, 781-784.
- Cline, V. B., Richards, J. M., & Needham, W. E. Creativity tests and achievement in high school science. *Journal of Applied Psychology*, 1963, 47, 184-189.
- Coates, S. *Preschool embedded figures test*. Palo Alto: Consulting Psychologists Press, 1972.
- Corbett, C. C. Effects of sex-role conventionality on sex-typed characteristics and personal functioning (Doctoral dissertation, Fordham University, 1974). *Dissertation Abstracts International*, 1974, 35, 3010B-3011B. (University Microfilms No. 74-25,112)
- Cropley, A. J. Creativity and intelligence. *British Journal of Educational Psychology*, 1966, 36, 259-266.
- Crutchfield, R. S., Woodworth, D. G., & Albrecht, R. E. *Perceptual performance and the effective person* (WADC-TN-58-60). Lackland Air Force Base, Texas: Personnel Laboratory, Wright Air Development Center, Air Research and Development Command, April 1958. (ASTIA No. AD-151 039)
- Cullen, J. F., Harper, C. R., & Kidera, G. J. Perceptual style differences between airline pilots and engineers. *Aerospace Medicine*, 1969, 4, 407-408.

3. Stewart, V. M. Sex and temperament revisited: A cross-cultural look at psychological differentiation in males and females. In H. A. Witkin (Chair.), *Cross-cultural studies of psychological differentiation*. Symposium presented at the meeting of the International Association for Cross-Cultural Psychology, Kingston, Ontario, August 1974.
4. Harris, F. Personal communication, 1959.
5. Guardo, C. *Personality, psychological differentiation and personal space*. Paper presented at the meeting of the Rocky Mountain Psychological Association, Las Vegas, Nevada, May 1973.
6. Crutchfield, R. S., & Starkweather, J. A. *Differences among officer personnel in perception of the vertical under distorting influence of a tilted frame* (Project No. 505-041-0001). Berkeley: University of California, Institute of Personality Assessment and Research, December 1953.
7. Ohnmacht, F. W. Personal communication, 1975.
8. Welkowitz, J. Personal communication, 1975.
9. Luborsky, L. Personal communication, 1970.
10. Witkin, H. A., Moore, C. A., Oltman, P. K., Goodenough, D. R., Friedman, F., & Owen, D. R. *A longitudinal study of the role of cognitive styles in academic evolution during the college years*. Graduate Record Examinations Board Research Report No. 76-10R. Princeton, N.J.: Educational Testing Service, 1976.
11. Tyler, L. E., & Sundberg, N. D. *Factors affecting career choices of adolescents* (Cooperative Research Project No. 2455). Eugene, Oregon: University of Oregon, 1964.
12. Bowles, A., & Boss, M. W. *Extent of psychological differentiation as related to achievement in science and attitude toward science*. Paper presented at the meeting of the American Educational Research Association, Chicago, April 1974.
13. Welkowitz, J. Personal communication, 1975.

### References

- Abelew, T. Sex role attitudes, perceptual style, mathematical ability and perceived parental child-rearing attitudes in adolescents (Doctoral dissertation, Fordham University, 1974). *Dissertation Abstracts International*, 1974, 35, 1439B. (University Microfilms No. 74-19,696)
- Acker, M. B. The relation of achievement need, time perspective, and field articulation to academic performance (Doctoral dissertation, University of California at Berkeley, 1967). *Dissertation Abstracts*, 1968, 29, 1492B. (University Microfilms No. 68-10,275)
- Adcock, C. J., & Webberley, M. Primary mental abilities. *Journal of General Psychology*, 1971, 84, 229-243.
- Adevai, G., Silverman, A. J., & McGough, W. E. Perceptual correlates of the rod-and-frame test. *Perceptual and Motor Skills*, 1968, 26, 1055-1064.
- Anderson, D. L. Cognitive styles and perceived liberalism-conservatism among Protestant ministers (Doctoral dissertation, University of Texas at Austin, 1971). *Dissertation Abstracts International*, 1972, 32, 6023B-6024B. (University Microfilms No. 72-11,302)
- Arbuthnot, J. B., & Gruenfeld, L. Field independence and educational-vocational interests. *Journal of Consulting and Clinical Psychology*, 1969, 33, 631.
- Axelrod, S., & Cohen, L. D. Senescence and embedded-figure performance in vision and touch. *Perceptual and Motor Skills*, 1961, 12, 283-288.
- Baker, E. *Perceiver variables involved in the recognition of faces*. Unpublished doctoral dissertation, University of London, 1967.
- Baker, M. A. S. The relationship of creativity to several selected personality variables (Doctoral dissertation, Washington University, 1970). *Dissertation Abstracts International*, 1971, 31, 4324B. (University Microfilms No. 70-26,845)

is not entirely consistent) that they attend more to verbal messages with social content, even when these messages occur in the periphery of attention (for example, Eagle, Fitzgibbons, & Goldberger, 1966; Eagle, Goldberger, & Breitman, 1969; Fitzgibbons & Goldberger, 1971; Fitzgibbons, Goldberger, & Eagle, 1965).

Another way in which relatively field-dependent persons show their "social orientation" is in taking greater account of external social referents in defining their attitudes and feelings (for example, Linton, 1952; McFall & Schenkein, 1970; Rudin & Stagner, 1958; Solar, Davenport, & Bruehl, 1969), particularly under conditions of ambiguity. It seems not implausible that their use of such referents is facilitated by the information they acquire through their greater attentiveness to social cues, as just described. Linton's study with an autokinetic situation provides a particularly good example of the responsiveness of field-dependent persons to external social referents. In the autokinetic situation a stationary pinpoint of light, viewed in a completely darkened room, is ordinarily seen as moving. The college undergraduates who served as subjects were asked to write down their judgments of the amount of light movement on each of a series of trials. The procedure was then repeated, but now subjects made their judgments on each trial after learning the judgment of a planted confederate who, by prearrangement, gave estimates substantially higher than the average of the subjects' initial judgments. To endow him potentially with some degree of prestige, the confederate was introduced as a senior psychology major. As predicted, field-dependent subjects showed significantly larger increases in their estimates under the influence of the confederate's judgments than field-independent subjects. This accommodation appears quite reasonable when we consider that because judgments in the autokinetic situation are made in total darkness, there is no frame of reference for estimating movement. Under these conditions of ambiguity, the estimates given by the confederate, whom the subjects had no reason to mistrust, provided additional information which field-dependent subjects, who are less likely to structure situations on their own, could use in making their judgments.

It is now also well documented that, in addition to being sensitive to social cues, and interested in what others say and do, relatively field-dependent persons are drawn to people, in the sense of liking to be with them. This "with-people" stance is even evident in such directly discernible ways as their use of interpersonal space. Several studies have demonstrated that field-dependent persons literally prefer to be physically close to others. In one of these studies, subjects were required to prepare a brief presentation on a topic assigned to them and then to

proceed to another room and make the presentation orally to the experimenter seated there (Justice, 1970). In another study, subjects were asked actually to assume the positions they considered optimal, maximal or minimal for comfortable communication with another person (Holley, 1972). In both studies, field-dependent subjects, relative to field-independent ones, took up positions significantly closer to the person with whom they were interacting. Trego (1972), who also determined how close to an "object person" his subjects moved, with variations in the initial distance between subject and object person, obtained results consistent with those of Holley and Justice. In still another study the nonverbal behavior of obese patients was examined, when seated two feet or five feet from the interviewer (Greene, 1973). At the greater distance compared to the shorter one, field-dependent persons showed a significant increase in a cluster of nonverbal behaviors (such as palms-up gesture, mouth touching, forward leaning) which loaded a "dependency" factor, interpreted as expressive of need for closeness to others. Field-independent persons were unaffected by the distance manipulation. On the other hand, at both distances, field-independent persons, as compared to field-dependent persons, showed significantly more nonverbal behaviors (such as arm crossing, leg crossing, absence of forward leaning), loading a "distancing" factor interpreted as reflecting a need to gain psychological distance from others. In three other studies, no relation was found between field-dependence-independence and social-distance preference (Evans, 1970; Wineman, 1974; Guardo, Note 5). It is noteworthy, however, that these studies used a questionnaire format or representations of human figures (such as silhouettes or cut-outs) to assess use of interpersonal space, rather than real people, as in the four studies cited above.

The ingredients of the social orientation of field-dependent persons that have been enumerated make it not surprising that they should be better liked (for example, Dingman, 1972; Oltman, Goodenough, Witkin, Freedman, & Friedman, 1975); perceived as warm, tactful, considerate, socially outgoing, and affectionate by others (Crutchfield, Woodworth, & Albrecht, 1958; Pemberton, 1952; Weissenberg & Gruenfeld, 1966); know and be known to more people (Oltman et al., 1975). These social qualities, taken together, seem likely to contribute to greater skill in getting along with people.

In contrast to the "with-people" orientation of field-dependent persons, field-independent persons tend to have a more impersonal orientation. For example, Pemberton (1952) found that field-independent subjects, in their responses to a personality inventory she developed, showed themselves to be "not sensitive

A word of caution is in order, however, against using the relations now found to exist between cognitive styles and educational-vocational interests, choices, and performance to perpetuate a self-fulfilling prophecy. It has been observed repeatedly, as we have seen, that relatively field-dependent students are not likely to do as well in mathematics and the sciences as more field-independent students. However, to this statement must be added the qualification: "with the present ways of teaching these disciplines." We have suggested that other methods than those commonly used in teaching mathematics and science—and perhaps even other kinds of teachers than those now predominantly engaged in teaching these subjects—may help field-dependent students perform better in these subjects than they now do. As we come to know more about how such students learn and the kinds of people they are, we will be in a better position to devise teaching approaches helpful to their mastery of these subjects. More positive experiences in their early encounters with mathematics and science may also encourage field-dependent students to be more venturesome in trying these disciplines. We may think in a similar way about doing more to help field-independent students with domains where interest in people and social sensitivity and skills are important. It is not difficult to see the benefit to some domains, such as medicine, in having in them more persons with both analytical/structuring competence and a social orientation.

We do not yet know what needs to be done, or how far it is possible to progress, in training students to move outside the channels into which we now find them directed by their cognitive styles; the malleability of learning approaches fostered by cognitive styles encourages us to believe that such movement can be achieved. We do not assume that everyone can take equally well to all domains or that it is a desirable goal of education to create a universe of jacks-of-all-trades. However, for the educator, the development of greater diversity in behaviors within individuals seems as important an objective as the recognition and the utilization of diversity among individuals.

#### Reference Notes

1. Witkin, H. A., Oltman, P. K., Cox, P. W., Ehrlichman, E., Hamm, R. M., & Ringler, R. W. *Field-dependence-independence and psychological differentiation: A bibliography through 1972 with index* (Research Bulletin 73-62). Princeton, N. J.: Educational Testing Service, 1973.
2. Witkin, H. A., Cox, P. W., Friedman, F., Hrishikeshan, A. G., & Siegel, K. N. *Supplement No. 1, Field-dependence-independence and psychological differentiation: Bibliography with index* (Research Bulletin 74-42). Princeton, N. J.: Educational Testing Service, 1974; see also *Supplement No. 2*, (Research Bulletin 76-28). Princeton, N. J.: Educational Testing Service, 1976.

What about those who break away from traditional sex roles? Is the woman who conforms less to traditional life styles and who ventures into the more masculine areas more field independent than the woman who adheres to the more traditional feminine role? There is some support for this notion. In two studies (Corbett, 1974; Welkowitz, Note 13) field-dependence-independence related significantly to attitudes toward women, with field-dependent women favoring a more "conventional," family-oriented role and field-independent women favoring a more "liberated," career-oriented role. Patrick (1973) found that women working for advanced degrees in "male-dominated professions" (lawyers, doctors, architects, and scientists) were more field independent than female college graduates who were, at the time of the study, engaged in full-time homemaking. Similarly, Manning (1969) found that homemaking motivation related to field dependence. In the same vein, Greenwald (1968) found that relatively field-independent women strongly favor an "intellectual role" for themselves, whereas relatively field-dependent women favor a "woman's role" just as strongly. On the other hand, Manning (1974) was unable to demonstrate a relation between field independence and career motivation for women, and Abelew (1974) found no relation between field-dependence-independence and sex-role attitude (family-oriented versus self-oriented) for senior high school girls (as well as boys). Abelew points out a troublesome pitfall inherent in attitude questionnaires, however. Even though field-dependent and field-independent girls may both endorse a more liberated sex-role attitude, they may do so for different reasons. In response to the times, the field-dependent girls may be adopting these attitudes because they are socially in vogue rather than because of a greater sense of separate identity.

In reporting the evidence on sex differences, whether in cognitive style, or in educational and occupational interests, choices, and performance, we are simply describing the situation as it now stands. There is no assumption that this is the way it must be. Whether through the action of the individual or of society, the sex-differences picture in the linked characteristics of cognitive style and interests-choices-performance can undoubtedly be altered, should such a change be desired.

The evidence reviewed in this section on career differentiation allows us to conclude that cognitive styles play an identifiable role, apparently starting quite early in life, in the complex process of an individual's educational-vocational evolution. Knowledge about students' cognitive styles may be useful to students themselves—and to those in a position to guide them—in the identification of suitable career goals.



to social undercurrents" and in reports by Crutchfield et al. (1958) and Crutchfield and Starkweather (Note 6) field-independent subjects were described as "cold and distant with others," "unaware of their social stimulus value" and "individualistic." There is additional evidence that, joined with their impersonal orientation, field-independent people are more likely to be interested in the abstract and theoretical (for example, Biggs, Fitzgerald, & Atkinson, 1971; Heath, 1964; Jay, 1950; Pemberton, 1952; Stidham, 1967).

A further indicator of the contrasting social and impersonal orientations of field-dependent and field-independent people—one which has obvious implications for career differentiation—is found in the tendency of field-dependent students, on the one hand, to favor educational-vocational areas in which involvement with others is a central feature and in which the subject matter of the discipline features human content, and the tendency of field-independent students, on the other hand, to favor areas that are more solitary in their work requirements and more abstract in their substantive content. We return to this issue in a later section where we consider educational-vocational interests and choices as a function of cognitive style.

The preceding discussion has been concerned with the area of experience where the person's own attributes and activities are the primary source (that is, the self), rather than stimuli in the field "out there," as in the case of perceiving. What has been said in that discussion suggests that field-independent persons are more likely to be aware of needs, feelings, attributes, which they experience as their own and as distinct from those of others. These distinctive needs, feelings, and attributes in effect provide internal frames of reference to which the person may adhere in dealing with external social referents. In the separateness of self from nonself, such people may be said to have a self which is experienced as segregated; and, with the availability to them of distinctive internalized frames of reference, they may be said to have a self which is experienced as structured. These are essentially the characteristics we earlier subsumed under "articulated." In contrast, the characteristics of relatively field-dependent persons of having less distinctive and less closely adhered to internal frames of reference, and of showing greater continuity between self and nonself—in other words, less segregation and less internal structure—are indicative of a more globally experienced self. We have spoken elsewhere of this difference in ways of experiencing the self as a difference in extent of "sense of separate identity" (Witkin et al., 1962/1974).

The difference in sense of separate identity between relatively field-dependent and field-independent people has consequences

for the nature of the social roles they are likely to assume in particular circumstances. In general, for field-dependent people, compared to field-independent ones, social roles tend not to be defined as distinct from the roles of those with whom they interact. Evidence of this is provided by several studies of therapist roles. One study showed that field-independent therapists were likely to adopt noninvolving or directive approaches to treatment, whereas relatively field-dependent therapists tended to favor approaches which were less directive and likely to involve them in interaction with their patients (Pollack & Kiev, 1963). Another study (Witkin, Lewis, & Weil, 1968) revealed a tendency for field-dependent therapists to share "speaking time" more equally with their patients than did field-independent therapists. We will see later, in the section, "How teachers teach," that there are similar differences in teachers' classroom behavior, as a function of differences in cognitive style.

We can do no more than mention here that the articulated-global dimension has been shown to extend beyond the domains through which we have thus far traced it, into the domains of body concept and defenses. In the body-concept domain it has been demonstrated that relatively field-independent persons are likely to have an articulated conception of the body, that is, to experience the body as having definite limits or boundaries and the parts within as discrete yet interrelated and formed into a structured whole; relatively field-dependent persons tend to have a more global conception of the body (Adevai, Silverman, & McGough, 1968; Faterson & Witkin, 1970; Goldberger & Bendich, 1972; Witkin et al., 1962/1974). In the defenses domain, more field-independent persons are likely to use specialized defenses, such as intellectualization; relatively field-dependent persons tend to favor nonspecific defenses, such as repression (Schimek, 1968; Witkin et al., 1962/1974).

We thus come out of this account of the unfolding of the work with the conclusion that there is a broad dimension of self-consistency in forms of cognitive functioning—the articulated-global dimension—which runs through the perceptual and intellectual domains, as well as domains commonly conceived of as "personality"—social behavior, body concept, and defenses.<sup>4</sup>

Using this detailed characterization of the articulated and global cognitive styles, we may now enumerate the essential characteristics of cognitive styles in general.

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<sup>4</sup> Elsewhere we have proposed that "differentiation" provides a developmental framework for viewing the self-consistencies that have been described here (Witkin et al., 1962/1974).

*Sex Differences*

The well-documented evidence of small but persistent sex differences in field-dependence-independence among adults suggests that it may be useful to examine the interests-choices-performance domains, in relation to cognitive style, for men and women separately. The studies reviewed in the preceding sections indicate that, in general, the role of cognitive style in each of these domains is similar for men and for women. There is also evidence, however, only now beginning to appear, that sex-role assignment, particularly among women, may override the effects of cognitive style on career differentiation that we have been describing.

For instance, in our longitudinal study we found that whereas 28% of the women in our sample graduated as education majors (mainly in elementary-school teaching), only 2% of our men did so. Though there is a tendency for education to be chosen by relatively field-dependent persons, in the case of women the sex-role stereotype that teaching is women's work was apparently so influential that teaching was selected by more than a quarter of our female sample, among whom there were obviously a number of relatively field-independent women. Again reflecting the influence of sex-role stereotypes, 21% of the men in our sample, as compared with 5% of the women, majored in science. A similar pattern has been reported by Goldman and Warren (1973). They found that the college men in their sample were much more likely than the college women to major in the physical and biological sciences, whereas the women were more likely to major in the humanities.

Further evidence of the interplay of cognitive style and sex-role assignment in the development of vocational orientation comes from a study by Scheibner (1970). Scheibner found that field-independent college men had more Mathematical-Analytical-Research and Scientific interests than their field-dependent male peers. However, when field-independent and field-dependent women were compared, the field-independent women significantly more often endorsed such items as author, editor, and columnist. Field-independent women also scored higher (though not significantly) than field-dependent women on the Artistic-Aesthetic and Entertainment-Expressions interest scales. Vernon (1972) found that greater field independence was associated with artistic interests for eighth-grade girls but not for eighth-grade boys. A reasonable interpretation of these two studies is that the field-independent females tended to have interests consistent with more socially acceptable feminine sex roles.

mathematics and science were especially common among the more field-dependent students;<sup>16</sup> the shifts serve to bring about a better fit between students' cognitive styles and their career choices.

#### *Educational-Vocational Orientation at Early Ages*

Several studies which used children as subjects suggest that cognitive style may begin to influence career differentiation quite early in life. Because early "signs" of later career development can be so very valuable in the guidance process, and yet are so rare, it is worth bringing together the evidence, some of it already cited, which suggests that field-dependence-independence may provide one such usable early sign.

We have just seen in the studies by Tyler and Sundberg and by Glatt, that, already at the eighth- and ninth-grade levels, conceptions of educational-vocational domains are more articulated among relatively field-independent than field-dependent children. Earlier development of articulated career conceptions is likely to affect progress toward career choices and manner of implementing these choices.

Several studies have examined children's orientation towards science, through questionnaires and inventories, as a function of cognitive style. The instruments used examined such features of orientation towards science as areas of interest in science, leisure-time investment in science, finding it fun "to mess around in science," and feelings toward science. Significant relations have been found between greater field independence and a more positive orientation toward science by Bowles and Boss (Note 12) for ninth-grade boys, and by Sieben (1971) for seventh-grade boys but not girls. Cline, Richards, and Needham (1963) did not find a relation for either boys or girls of high school age. Relevant to these observations is the finding by Karp (cited in Witkin et al., 1962/1974), that relatively field-dependent 10-year-old boys significantly more often chose as their eventual occupation the one most frequently selected by their peer group.

While the evidence is still sparse, it seems promising enough to encourage further research on early cognitive-style influences in the evolution of educational-vocational interests and choices.

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<sup>16</sup> This outcome would appear to lend support to the view that the relationship found between field independence and choice of the mathematics and sciences domain is a function of field-independent people choosing these domains over the alternative view that the relationship is a result of the fact that experience in these domains makes people field independent.

First, cognitive styles are concerned with the form rather than the content of cognitive activity. They refer to individual differences in *how* we perceive, think, solve problems, learn, relate to others, etc. The definition of cognitive styles is thus cast in process terms. This feature is a natural consequence of the origin of cognitive-style dimensions in laboratory studies, where process is the central issue. The experimental literature on the processes underlying field-dependent and field-independent behavior is now quite extensive (Witkin et al., 1962/1974; Witkin et al., Note 1; Witkin et al., Note 2). As we make progress toward more precise specification of these processes, suggestions are emerging, as we shall see, for ways of teaching students to use problem-solving strategies most appropriate to their styles, and even to shift to strategies more suitable for the task at hand than their preferred strategies.

Second, cognitive styles are pervasive dimensions. They cut across the boundaries traditionally—and, we believe, inappropriately—used in compartmentalizing the human psyche and so help restore the psyche to its proper status as a holistic entity. This characteristic has important implications for the educational setting. Reflecting their pervasiveness, cognitive styles carry a message about what we traditionally call “personality.” So, it is a feature of personality, and not alone of cognition in the narrow sense, that an individual likes to be among people, is particularly attentive to what others say and do, and takes account of information from others in defining his own beliefs and sentiments. It is something of a paradox—but on the surface only—that tests of cognitive style have potential value in assessing what have come to be called “noncognitive” attributes. The pervasiveness of cognitive styles also means that they can be assessed by nonverbal (perceptual) methods. This is a feature which also stems from the origin of cognitive-style work in the laboratory. To the extent that perception can be assessed by objective, controlled techniques, perceptual performance may be used as a measurable “tracer” for identifying an individual’s cognitive style. The use of nonverbal perceptual techniques to assess an individual’s cognitive makeup helps avoid the penalty which students out of the mainstream culture commonly suffer on our usual heavily verbal assessment procedures (Witkin, Faterson, Goodenough, & Birnbaum, 1966).

A third characteristic of cognitive styles is that they are stable over time. This does not imply that they are unchangeable; indeed, some may easily be altered. In the normal course of events, however, we can predict with some accuracy that a person who has a particular style one day will have the same style the next day, month, and perhaps even years later. This

stability makes stylistic dimensions particularly useful in long-range guidance and counseling.

Fourth, with regard to value judgments, cognitive styles are bipolar. This characteristic is of particular importance in distinguishing cognitive styles from intelligence and other ability dimensions. To have more of an ability is better than to have less of it. With cognitive styles, on the other hand, each pole has adaptive value under specified circumstances, and so may be judged positively in relation to those circumstances. This is clearly evident in the case of the articulated-global dimension, where the cluster of competence in cognitive articulation plus an impersonal orientation, at one pole, and the cluster of a social orientation and social skills plus less competence in articulation, at the other pole, may each be seen as especially suited to meet the requirements of particular tasks. When we come to discuss career differentiation, we will provide a number of illustrations of this, but one example may be cited here. In a recent study (Quinlan & Blatt, 1972), psychiatric student nurses who were judged to be good by their mentors were compared on tests of field-dependence-independence to surgical nurses who were judged to be good. Whereas the psychiatric group proved to be relatively field dependent, the surgical group was relatively field independent. This outcome is not surprising when we consider the tasks to be performed in psychiatry and surgery. Effective work in psychiatric nursing leans heavily on an interest in people and on social sensitivity, but not particularly on analytical skills. This job description fits the makeup of the relatively field-dependent individual. In contrast, surgical nursing does not call particularly on social interests and sensitivities; too often the surgical nurse's encounter with a patient is limited to a small segment of the patient's exposed abdomen! Success as a surgical nurse is likely to depend more on skill in quickly disembedding the correct forceps from a complex array of instruments on a surgical tray. This job description is in line with the makeup of the relatively field-independent individual.<sup>5</sup>

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<sup>5</sup> Although the articulated-global dimension is bipolar, all the tests now commonly used in its assessment require an articulated approach for successful performance. An urgent task now to be met is the development of standardized tests that require a global approach for successful performance. There is another feature worth noting about the present psychometric state of affairs in assessment of the articulated-global dimension. Because tests of cognitive articulation, such as the standard tests of field independence, are abilities tests, and because abilities may share an underlying general competence component (G), some relation may be expected between field-independence measures and other ability measures. Positive correlations have, in fact, been reported, but not consistently, and when they do occur, they tend to be quite small. Taking as illustrative so important a human competence as verbal ability, we find that tests of this ability, such as the

included such characteristics as "concrete" and "using associations rather than similarity as a basis for grouping." Children who never used this kind of classification almost all earned scores that were in a field-independent direction on tests of that dimension; the reverse was not true, however. In another study with children (eighth-grade boys) Glatt (1970) assessed "readiness for occupational planning," as judged from interviews. Assessments of readiness made use of such criteria as: awareness of factors relevant to curriculum choice and to occupational choice; accuracy of self-appraisal of cognitive abilities; and ability to verbalize strengths and weaknesses. According to ratings based on such criteria, relatively field-independent boys were found to show greater readiness for occupational planning. Clar (1971) observed that the more field-independent students attending a university counseling center showed some tendency, according to judgments of their counselors, to have more articulated vocational interests and to be more realistic in their initial vocational choices, and that there was a tendency for their vocational interests to be more specialized. In contrast, the relatively field-dependent counselees were more often definitely undecided about vocations at the termination of counseling. Clar also reports that counselees taking a more active stance toward counseling, as judged from statements made in presenting their problems, were significantly more field independent than counselees who took a passive stance. Along the same lines, it has been observed by Osipow (1969) that a group of college women admitting difficulty in making career choices and uncommitted to a course of study were significantly more field dependent than each of four other groups of women who were already enrolled in specific programs and reported experiencing greater ease in making career choices. Finally, Scheibner (1970) found that relatively field-independent college men, compared to more field-dependent men, showed better agreement between vocational interests and vocational goals. This relation was not found for college women, however.

The process of making career choices was examined in our own longitudinal study of cognitive style as a factor in academic evolution at another juncture where it may manifest itself: in abandoning a chosen major in favor of a new major. For each student we determined whether a shift took place from the major specified on college admission and the nature of the change when it occurred. In examining the subject-matter areas involved in switches in major, we looked particularly at shifts between the mathematics-science domain, clearly favored by field-independent students, and education domains, favored by field-dependent students. This analysis revealed that shifts out of

students who did well in psychiatry tended to be more field dependent. To be cited here, too, is the finding from a study by MacKinnon (1962). MacKinnon found practicing architects selected as outstandingly creative by their peers to be markedly field independent, whereas writers selected on a similar basis were quite field dependent. As a noteworthy aside, in a test of verbal ability, the two groups shifted rank among the occupational groups compared, the writers moving to a top ranking and the architects to a low ranking. Finally, we cite the finding of Kennedy (1972) that field independence was a significant predictor of success in training of the Naval Flight Officer Candidates and the Naval Aviation Officer Candidates he studied. These findings were validated in a second study. It should be cautioned, however, that the relation reported by Kennedy is quite small although, with the large number of cases he used, his results were significant.

Some of the relations reviewed in this section may be connected in an interesting though complex way to the match-mismatch issue considered earlier. We have just seen that field-independent students are likely to do better in mathematics and the sciences. We now also know that teachers who teach these subjects are likely themselves to be relatively field independent. May the better performance of field-independent students in these subjects therefore reflect, in some degree at least, a positive effect of teacher-student cognitive-style match on student achievement and/or interpersonal attraction? If research shows the answer to this question to be positive, there will in turn arise the question of whether methods of teaching mathematics and science can be devised which are more suitable for field-dependent students than the methods those now teaching these subjects are likely to favor as a function of their own field-independent cognitive style. The possibility of using appropriately different approaches in teaching mathematics to relatively field-dependent and field-independent students has recently been raised by Spitler (1971).

### *Making and Changing Educational Choices*

Evidence is beginning to emerge that cognitive styles enter into the *process* of making career choices. The influence of cognitive styles has been identified in how careers are conceptualized, in the ease with which career choices are made, and in the shifting of majors.

Tyler and Sundberg (Note 11), in a study of ninth-grade Dutch children, explored these children's classification of occupational concepts. Among the classifications identified was one which



As pointed out elsewhere (Witkin, 1974), the more neutral character of cognitive styles, deriving from their value bipolarity, makes it less threatening and therefore easier to communicate information about an individual's cognitive style directly to him, than it is to convey some kinds of information about his abilities, as, for example, telling him he has a low IQ. In a period when we are seeking ways of using evaluation procedures to serve the student himself, rather than the institution, this feature of cognitive styles is indeed an important advantage.

Taking as background what we have said about the articulated and global cognitive styles, and about the nature of cognitive styles in general, we turn now to the implications of work on these styles for educational issues.

### *Educational Implications of Cognitive Styles*

#### *How Students Learn*

Studies of the role of cognitive style in student learning have used both the cognitive and social characteristics constituent in the articulated-global dimension to conceptualize relations between learning behavior and cognitive style. Of the four learning areas we consider, the first two have used the social characteristics as a bridge between the domains. These two areas are learning of social material and the effects of social reinforcement. The third and fourth learning areas used mainly the cognitive characteristics as a bridge. These are the areas of mediating mechanisms in learning and cue salience.

#### *Learning of Social Material*

We have seen that relatively field-dependent<sup>6</sup> people are particularly interested in and selectively attentive to social aspects of the surround. It need not be surprising to find that, because of this orientation, such persons are better at learning materials

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Vocabulary, Information, and Comprehension subtests of the Wechsler scales, load a separate factor from tests of field independence (Goodenough & Karp, 1961; Karp, 1963). Furthermore, scores from the Verbal Scholastic Aptitude Test, one of the major standard tests of verbal functioning now in use in the educational setting, have been found to show an average correlation of less than .17 with field-independence measures in the data from 21 studies. In addition, the results of 29 studies with adults which examined the relation between scores from tests of field-dependence-independence and scores from vocabulary tests yielded a mean correlation of only .18 between these two kinds of measures.

<sup>6</sup> Because the early designations, "field dependent" and "field independent" have come into popular usage, we shall employ them in the remainder of this paper, taking them to stand for "global" and "articulated."

with social content. Now relatively field-dependent and field-independent persons seem not to be appreciably different in sheer learning ability or memory. However, reflecting differences between them in what is relevant, attended to, and salient, field-dependent persons tend to be better at learning and remembering social material than persons who are relatively field independent.

Illustrative of several studies which examined the role of cognitive style in learning social material is one by Ruble and Nakamura (1972). The children who were subjects in the study were given three concept-attainment problems; on each trial of each problem their task was to identify the correct figure among three shown to them. In the first problem, "large size" was correct, but the experimenter provided an additional redundant cue, social in nature, by looking at the figure which was correct. In the second problem, the social cue alone was relevant; and in the third problem, size alone was the correct cue. The field-dependent children showed better learning than field-independent children on the second problem, which featured the social cue alone. On the other hand, the field-independent children showed better learning on the third problem, which did not involve social cues at all. This pattern of findings makes it evident that field-dependent children were better at picking up social cues provided by the adult experimenter, and using these cues in learning.

Another example of field-dependent persons' superior memory for social information comes from a study by Crutchfield et al. (1958). These investigators found that relatively field-dependent army officers did significantly better than field-independent officers in recognizing photographs of other officers who had spent several days with them at an assessment center. The clear finding from a number of studies (for example, Adcock & Webberley, 1971; Baker, 1967) that field-dependent persons are not superior in recognizing faces when the task is one of intentional learning of faces suggests that their superiority in the Crutchfield et al. study was a function of selective attention to the faces of their peers rather than of better ability to learn and remember such material.

Relevant here too are studies which have shown that field-dependent persons are better at learning social material, when the material is peripheral to the task on which they are concentrating. For example, Fitzgibbons et al. (1965) used an incidental-learning paradigm in which the subject was given a learning task to perform while in another part of the room, separated by a curtain so that sounds could get through, a "planted" subject, in another "experiment," called out words.

In contrast to the very large body of work on performance in academic domains likely to be favored by field-independent students, there have been very few studies which looked at domains where good performance may be expected to go with field dependence. This striking disparity in effort may have several bases. First, work—both conceptual and empirical—on the impersonal-interpersonal constituent of the articulated-global dimension has developed relatively recently. As it has become clear from this work that field-dependent persons are likely to have a predominant social orientation, a stimulus (and an hypothesis) is now provided for looking at performance in educational-vocational domains where such an orientation might benefit performance. Earlier, the evidence on interests and choices of field-dependent persons was the accidental by-product of the use of comprehensive inventories and course coverage, rather than the product of focused inquiry. Another possible reason for less research on performance of field-dependent persons in areas where they may be expected to do well is that it is more difficult to develop adequate tests of achievement in these areas, which are less delineated in content and less easily defined as to the processes they involve than tests in the mathematics-science domain.

In the present state of the evidence, we may say that there has not yet been a real check on the expected relation between field dependence and better performance in educational domains where a social orientation is emphasized. What little evidence there is suggests that investigation of this relationship will require careful delineation of specialties. This is because, as we have suggested, in a number of instances the specialties to which field-dependent persons are drawn are constituents of broad-gauge disciplines. Psychology is an example, and we may recall here the finding of Nagle (1968) that graduate students in clinical psychology tend to be field dependent and those in experimental psychology field independent. It seems clear that labels in the social sciences domain are likely to cover greater diversity in the kinds of subject matter they encompass than labels in the mathematics and science domains.

We consider finally achievement in *vocational* domains as a function of cognitive style. Little has been done on this issue, but the evidence available is consistent with expectations. To the extent that the supervisors' ratings of the performance of surgical and psychiatric student nurses in the Quinlan and Blatt study (1972), cited earlier, were based in part on observations in the actual work situation itself, that study is relevant here. It will be recalled that student nurses who were judged to have done well in surgery were relatively field independent, whereas

relatively field-independent persons are likely to express interest in these domains, to choose them for specialization, and to perform better in them once the selection has been made. It is noteworthy that relationships between cognitive style and achievement appear despite the restricted range in cognitive-style scores likely to occur in groups filtering into these domains.

Results obtained with the Mathematics Scholastic Aptitude Test (MSAT), which are relevant here to the extent that MSAT assesses mathematical competence, merit separate consideration because of the wide use of the SAT in the educational setting. Indeed, the evidence from studies which have examined this relation is in keeping with expectations, although, for reasons not now apparent, the relation is stronger for women than for men. In all 11 studies which used women as subjects, the relation was significant; the mean of the correlations of the nine studies which used this statistic was .44. In studies with men a significant relation was found in 11 of 16 studies; and the mean of the correlations of the 13 studies which report this type of measure was .29 (for example, Abelew, 1974; Bieri, Bradburn, & Galinsky, 1958; Farr, 1969; McCaulley, 1965; McKenna, 1968).<sup>14</sup>

Studies of the relation between cognitive style and performance have been less frequent with high school students than with college students, and their results not as clear. In only about half of the studies with high school students now on record was the relation between mathematics-science achievement and measures of field-dependence-independence significant, although in every study, the difference in performance as a function of cognitive style was in the expected direction. Several possible bases for the difference in outcome at the college and high school levels suggest themselves. One is that the content of courses at the high school level which bear the labels "mathematics" and "science" may not rely as much on field-independent functioning for effective performance as courses carrying these designations at the college level. A second is that interpersonal attraction may enter to a greater extent in teachers' grades at the younger levels.<sup>15</sup>

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<sup>14</sup> In contrast with the picture for the Mathematics SAT, in 9 studies with women, the mean correlation between Verbal SAT scores and measures of field-dependence-independence was .14; in 13 studies with men, the mean correlation was .13.

<sup>15</sup> Because of uncertainty about what "mathematics" encompasses at the elementary school level, we have not considered here the few studies which examined the relation of cognitive style to performance in mathematics. In two studies conducted with elementary school children, a significant relation between field independence and science performance was found in one (Sieben, 1971), but not the other (Vernon, 1972).

Among these words were some that had social connotations and others that were neutral. At the end of the experiment the "real" subject was unexpectedly asked to recall any words he had heard from the other side of the curtain. The relatively field-dependent subjects recalled more social words than the field-independent subjects, but for the neutral words there was no difference.<sup>7</sup>

The findings that have been reviewed suggest that field-dependent persons are better at remembering social material and that this superiority is based on their selective attention to social material.

The implications of these findings for the classroom are apparent. Because of their social orientation relatively field-dependent children are apt to be particularly adept at learning and remembering materials that have social content. To the extent that the inferiority of field-independent children with such material is a function of lack of attention, rather than lack of ability, their performance can easily be made equivalent to that of field-dependent children by bringing social material to focal attention, as was done in studies which made the learning of such material an intentional task.

#### *The Effects of Reinforcement*

A second way in which students' cognitive styles may influence their learning is found in the effects of different kinds of reinforcement. The relations that have been observed between cognitive style and reinforcement may be understood on the basis of differences in sense of separate identity between relatively field-dependent and field-independent persons. As described earlier, individuals with an articulated cognitive style are likely to have internalized frames of reference to which they adhere as guides to self-definition and which they maintain as distinctly separate from external social referents. Those with a global style tend to rely more on external referents for self-definition. On this basis we may expect that field-dependent students would be more likely to require externally defined goals and reinforcements than field-independent students who tend to have self-defined goals and reinforcements.

<sup>7</sup> Other studies have demonstrated a similar superiority of field-dependent persons in incidental learning of social cues (for example, Eagle et al., 1969; Messick & Damarin, 1964), although there have been studies in which this superiority was not evident (for example, Beijl-Docter & Elshout, 1969; Fitz, 1971). In contrast to this picture for incidental learning of social material, the results of numerous studies of incidental learning of nonsocial material show a small but general superiority of field-independent subjects in such learning tasks (for example, Beck, 1971; Iman, 1973; Klein, 1968; Valinsky, 1971; Witkin et al., 1962/1974).

A great deal of evidence is now available, from experimental situations, on the relation between field-dependence-independence and the effects of various kinds of reinforcement. The evidence suggests, as expected, that field-independent persons tend to learn more than field-dependent persons under conditions of intrinsic motivation (for example, Fitz, 1971; Paclisanu, 1970; Steinfeld, 1973). However, this difference disappears when external rewards for learning are introduced, regardless of whether the rewards are material in nature or in the form of praise (for example, Ferrell, 1971; Paclisanu, 1970; Steinfeld, 1973).

The study by Steinfeld may be used to illustrate these findings. Eight- and 11-year-old children played an experimental game called "marble in the hole." There were two holes into which the child could drop marbles. After a baseline period in which the child's preference for one hole or the other was observed, the nonpreferred hole was reinforced, and the effect of the reinforcement of the percentage of marbles dropped into this hole was determined. The effects of three types of reinforcements were then compared. In one type of reinforcement (abstract) a flashing light came on when the child dropped marbles into the initially nonpreferred hole. In this condition light served as a cue for self-reward, and, as expected, field-independent children learned more than field-dependent children. A second type of reinforcement (material) made use of token rewards which were redeemable for small toys. With such material rewards field-dependent children did as well as field-independent children. A similar result was obtained with a third type of reinforcement (social) which took the form of praise from the experimenter. Thus, with intrinsic motivation, field-independent children did better, but this difference was eliminated when extrinsic rewards—material or social—were used.

Most of the research on the effects of punishment have made use of social reinforcement given in the form of verbal criticism. These studies provide evidence that field-dependent people are more affected by criticism than field-independent people. Whether the criticism has a positive or adverse effect on learning depends upon the manner in which the criticism is administered. Either way, this type of external reinforcement seems to have a particularly potent effect on field-dependent persons (for example, Duvall, 1970; Ferrell, 1971; Fitz, 1971; Konstadt & Forman, 1965; Randolph, 1971).

Whether used consciously or unconsciously, reinforcement is one of the handiest tools in the teachers' armamentarium of devices for perpetuating some student behaviors and eliminating others. Common sense and everyday experience in the class-

proved to be significantly different from each other in extent of field independence. Thus, systems engineers have been found to be more field independent than nonsystem engineers (Nussbaum, 1965), and student pilots in a naval officer training program more field independent than student nonpilots (navigators, radar intercept operators, etc.) (Kennedy, 1972). Also relevant here is a study by Rosett, Nackenson, Robbins, and Sapirstein (1966) which showed that engineering students with exclusive science interests on the Thurstone Interests Schedule were significantly more field independent than engineering students who showed, in addition, interests in music, art, and business.

#### *Achievement in Specialized Educational-Vocational Areas*

We have seen that field-dependence-independence does not show much relation to overall achievement measures, such as college grade-point average. In contrast, numerous studies have demonstrated a relation between cognitive style and performance in specialized areas. The relations observed in these studies are generally consistent with expectations and, of course, with the relations reported earlier between cognitive style and educational-vocational interests and choices.

We consider, first, performance in the academic situation. By far the largest number of studies here have looked at achievement of students in the mathematics-science area, and to an extent in engineering and architecture. Achievement has most often been assessed by grades or teacher-made test scores in individual courses or clusters of courses or by scores on standard achievement tests; several studies have considered teacher's ratings of student performance, and a few have examined overall grade-point averages earned by students specializing in one of these domains, so that grades in courses in the specialty have strong representation in these averages. Subject populations sampled have included college students, high school students, and students in special training programs.

In a good majority of the large number of studies with college populations, relatively field-independent students were found to perform significantly better in the mathematics, sciences, engineering, and architecture domains than field-dependent students (for example, Dubois & Cohen, 1970; Greenfield, 1971; Hunt & Randhawa, 1973; Margulis, 1972; Rosett, Robbins, & Watson, 1968; Schmidt, 1973; Stein, 1968; Williams, 1970). In the studies where a significant relation was not found, the results were invariably in the expected direction. If we consider the successive steps involved in career differentiation, we can see when we put this finding together with observations made earlier that

categories such as "mathematics," "science," "architecture," "engineering," "social work," and "elementary school teaching" may be regarded as "narrow-gauge" domains, in the sense that they require particular attributes (analytical/structuring competence or a social orientation). On the other hand, categories such as "social science" are "broad-gauge" in the sense that within them there exist opportunities for persons with diverse attributes. As one might therefore expect, in the few studies where "social sciences" was used as a category, its choice tended to be associated only weakly with greater field dependence. It is for these reasons that within-category relationships between cognitive style and vocational choices are likely to be found in broad-gauge categories. The data summarized in Table 1 support this expectation. Each line in the left-hand column of the table lists the interests/choices of relatively field-dependent persons, as identified in one or more studies (for example, Chung, 1967; Clar, 1971; Nagle, 1968; Pierson, 1965; Pollack & Kiev, 1963; Quinlan & Blatt, 1972; van Meel-Jansen, 1974); in the right-hand column, on the same line, we see the interests/choices in the same educational-vocational domain of relatively field-independent individuals. Exceptions to these within-occupation contrasts are rare (Schaefer, 1973).

There are several studies which have examined cognitive styles of groups that, while generally quite field independent,

TABLE 1  
Interests/Choices of Relatively Field-Dependent and Field-Independent  
Individuals within Educational-Vocational Domains

<i>Field Dependent</i>	<i>Field Independent</i>
Clinical psychology	Experimental psychology
Psychiatric nursing	Surgical nursing
{ Psychiatric practice favoring interpersonal relations with patients }	{ Psychiatric practice favoring impersonal forms of therapy }
{ Business personnel director Business education teacher }	{ Business production manager }
{ Social studies teacher Elementary school teacher }	{ Natural science teacher Industrial arts teacher }
Art students with informal art style	Art students with formal art style



rooms make it not at all surprising that reinforcement does not work equally well for all students or that particular kinds of reinforcement have differential effects on different kinds of students. While applied research in the classroom has only just begun (Raab, 1974), the evidence we have reviewed suggests that field-dependence-independence may provide a useful basis for predicting which students are likely to be affected by what kinds of reinforcement.

#### *The Use of Mediators in Learning*

In the cognitive realm, as we have seen, persons with an articulated cognitive style are likely to analyze a field when the field is organized, and to impose structure on a field when the field lacks organization of its own. Persons with a global style are more likely to go along with the field "as is," without using such mediational processes as analyzing and structuring. In many situations field-independent people tend to behave as if governed by general principles which they have actively abstracted from their experiences. Depending on the situation they find themselves in, these abstractions may be correct or incorrect, useful or useless, but the performance of people to whom they are available may be understood in terms of the operation of such mediating concepts. In contrast, for field-dependent people information-processing systems seem to make less use of such mediators.

The principle that field-independent people more often make use of mediators is illustrated by studies of organizational factors in learning. Frequently in learning, the material to be learned lacks clear inherent structure, creating the requirement that the learner himself provide organization as an aid to learning. Field-dependent persons are likely to have greater difficulty in learning such material compared to field-independent persons who are more likely themselves to provide the mediating structural rules that are needed to facilitate learning. On the other hand, when the material to be learned is presented in an already organized form, so that structuring is not particularly called for, field-dependent and field-independent people are not likely to differ in their learning. Several studies may be cited to illustrate these points.

In one study (Fleming, 1968), a list of words was shown to field-dependent and field-independent subjects and free recall of the words subsequently measured. A novel feature of the study was that the words belonged to a hierarchical structure and were presented to the subjects in either a superordinate to subordinate sequence (e.g., animal, vertebrate, man) or vice versa (e.g.,

man, vertebrate, animal). When the superordinate items came first, the word set was given an inherent organization from the beginning. This advance organizational aid to learning was missing, however, in the subordinate to superordinate sequence. It might be expected, therefore, that the subordinate to superordinate sequence would be particularly difficult for field-dependent people. This proved to be true. Fleming's field-dependent subjects recalled fewer words than his field-independent subjects when this sequence was used. In contrast, no significant relationship was found between field-dependence-independence and word recall with the structured, superordinate to subordinate sequence.

In a second study, Koran, Snow, and McDonald (1971) examined the acquisition of a teaching skill from written and video-modeling procedures. These two treatments were found to be differentially effective for relatively field-dependent and field-independent intern teachers. Field-dependent teachers were found to benefit more from the video modeling than field-independent teachers who did as well with the written as with the video modeling. The authors suggest that for the more field-dependent teachers

The video-modeling treatment . . . through explicit, concrete presentation of the stimulus elements . . . may provide a behavioral representation for the learner that he could not generate for himself if given the written-modeling treatment. (p. 226)

Two studies which used programmed instruction sequences varying in the amount of structure provided by the programmed text are also relevant here. In the first study (Schwen, 1970), the number of generalizations and examples given before an active response was required by the learner was varied. In one (large-step) version of the text, all of the generalizations of an "imaginary" science were presented first with examples and discussion, and then the learner was asked to answer questions and to solve some problems, with corrective review if he responded incorrectly. In the second (small-step) version, each generalization was presented individually with examples and discussion, and the learner answered questions with corrective review after each section before proceeding to the next one. In this way, the second version broke the learning sequence down so that each learning block covered one generalization at a time, while the first version left the learner to monitor his own learning of the material before the final test. In the small-step program condition, there was no relation between field-dependence-independence and retention three weeks later. However, in the large-step program

strongly reinforce the finding from the studies of interests that relatively field-independent persons favor impersonal domains which require competence in cognitive articulation and field-dependent persons favor interpersonal domains which do not call for that kind of cognitive competence (for example, Baker, 1971; DeRussy & Futch, 1971; Holtzman, Swartz, & Thorpe, 1971; Kangas, 1971; Mayo & Bell, 1972; Osipow, 1969; Paeth, 1973; Peterson & Sweitzer, 1973; Swan, 1974; Witkin, Moore, Oltman, Goodenough, & Friedman, Note 10).<sup>13</sup>

In the academic setting, relatively field-independent college and graduate students are likely to choose for specialization such fields as, for example, the sciences, mathematics, art, experimental psychology, engineering, architecture. Relatively field-dependent students are likely to choose, for example, sociology, humanities, languages, social work, social services (religion), elementary school teaching, education, clinical psychology, writing, nursing. Complementing these findings, studies of persons already engaged in occupations have shown that engineers, architects, Air Force captains, mathematics-science teachers, and airplane pilots are likely to be very field independent (Barrett & Thornton, 1967; Crutchfield et al., 1958; Cullen, Harper, & Kidera, 1969; DiStefano, 1970; MacKinnon, 1962), whereas social-studies teachers (DiStefano, 1970), social workers (Braun, 1971), and writers (MacKinnon, 1962) tend to be field dependent.

The positive orientation of field-dependent persons toward domains in which "people" content is identifiably involved may be connected with the earlier observation that such persons are attentive to and therefore more likely to learn about the social content of any situation. Their better learning of social types of material is likely, even very early on, to encourage a favorable attitude toward fields which feature such material and so foster their interest in and choice of such fields.

#### *Interests/Choices within Educational-Vocational Domains*

Congruent with the differences in educational-vocational interests and choices that have been observed *between* domains are the differences found *within* domains.

The within-domain relations have been observed in "broad-gauge" rather than "narrow-gauge" disciplines. Vocational

<sup>13</sup> In the Witkin et al. study (Note 10) the relations observed between cognitive style and academic choices remained significant after partialling out measures of ability from SAT-V and SAT-M, suggesting that cognitive style makes a contribution to academic choices separate from the contributions made by these abilities. We may also note here the clear evidence from the factor-analytic literature that tests of field-dependence-independence, such as the embedded figures test, and tests of spatial-visualization ability load separate first-order factors.

of these two kinds of persons, with striking results. Clar created four interest categories on the basis of these two dimensions, with six vocations in each category. The impersonal-analytical category included chemist, mathematician, biologist, engineer, physicist, and artist. The interpersonal-nonanalytical category, at the opposite extreme, included social worker, personnel director, business-education teacher, chamber of commerce executive, credit manager, and community recreation director. Clar found that measures from the embedded-figures test she used to assess field-dependence-independence correlated significantly and positively with all six Strong measures in the impersonal-abstract category (more field-independent persons favored these vocations) and significantly but negatively with all six Strong measures in the interpersonal-nonanalytical category (more field-dependent persons favored these vocations). Measures for each set of six Strong measures in the two intermediate "mixed" categories (impersonal-nonanalytical and interpersonal-analytical) showed correlations which were variable, both as to direction and statistical significance, with measures of field-dependence-independence. Vocational interest measures are thus more likely to show a relation to measures of field-dependence-independence when they call for both the cognitive and social characteristics found together toward each pole of that dimension.

Several additional studies are worth mentioning because they suggest another parameter that may be involved in the relation between interests and cognitive style. In one study (Witkin et al., 1962/1974) it was found that field-dependent 10-year-old boys preferred the particular vocation most frequently chosen by their peer group. Linton (1952) similarly found that relatively field-independent college students expressed preferences for occupations that were unusual for their peer group. These findings may be taken as another manifestation of the greater reliance of field-dependent persons on external social referents.

#### *Educational-Vocational Choices*

Choices represent an actual commitment to a domain, and so are "harder" expressions of educational-vocational orientation than interests. At the same time, since both choices and interest have the same underlying sources, it is not surprising to find that educational-vocational choices show patterns of relations to cognitive style similar to those found for interests. The very large number of studies in which the relation between educational-vocational choices and cognitive style has been examined are, with only few exceptions, consistent in their outcome; and they

conditions, greater field independence was associated with greater retention.

In the second programmed instruction study (Renzi, 1974), the amount of feedback given the learner was varied. Each subject was required to learn to draw an "exact" ellipse. In one version of the text, subjects were not given feedback about their performance when they attempted to draw the ellipses required by the text. In the second version, a correctly drawn ellipse was provided as an overlay in the text. Results indicated that the performance of relatively field-independent university students was not influenced by whether or not they received feedback in the text. On the other hand, field-dependent students performed significantly better on the posttest when feedback was provided in the text.

Consistent with these findings on field-dependent people's greater need for external structuring were the teachers' reports on students of different cognitive styles made after a minicourse organized by us for a study (unpublished) of the role of teachers' and students' cognitive styles in the teaching-learning process, to be described later. In an analysis of teachers' responses to a questionnaire he constructed for this study, our colleague, Walter Emmerich, found that teachers described field-dependent students as profiting more from "providing students with a plan"; field-independent students were described as profiting less from such a teaching approach.

Evidence from another quite different naturalistic situation—psychotherapy—suggests that the greater need of field-dependent persons for externally provided structure is a general characteristic of their behavior. Greene (1972) found that therapists significantly more often chose supportive therapy for their field-dependent patients and modifying therapy for their field-independent patients. A similar result has been reported by Karp, Kissin, and Hustmyer (1970). In supportive therapy the therapist assumes greater responsibility for providing structure for the therapeutic process, whereas in modifying therapy the patient himself plays a part in determining the content and progress of the process.

There is still another line of evidence which shows that field-independent persons are more likely to use mediators, of their own design, in dealing with a learning task, whereas field-dependent persons are more likely to rely on characteristics of the learning task itself. This evidence comes from studies of concept attainment. Two main kinds of theoretical models have been traditionally used to describe the process of concept attainment. One model assigns an active role to the learner; the learner forms an hypothesis as to what the concept may be, and

he then tests the hypothesis by applying it to exemplars of the concept class. If the hypothesis is found wanting, a new hypothesis is formulated, following some strategy of search for the correct concept. In this view, the hypothesis formulated by the learner, and the rules which govern the sequence of hypotheses he adopts, are both regarded as learning mediators. The hypothesis-testing model of concept attainment has been intensively studied by Bruner, Goodnow, and Austin (1956), among many others. In the second model of concept attainment the learner is conceived to have a more passive or spectator role. As each new example of a concept is encountered, the constant relevant features of the concept class gradually emerge and the more variable, irrelevant features of the examples wash out (Woodworth, 1938). This view of concept attainment postulates the use of neither mediating hypotheses nor hypotheses-testing strategies.

If the use of mediators is indeed more characteristic of field-independent than field-dependent people, we would expect that the former would attempt to use an hypothesis-testing approach and the latter a spectator approach to concept attainment. The results of a study by Nebelkopf and Dreyer (1973) provide support for this expectation. These investigators studied the shape of learning curves of field-dependent and field-independent subjects in a concept-attainment task. Their field-independent subjects showed no significant change in accuracy from trial to trial for a period of time, but then a sudden improvement in performance occurred as the criterion was achieved. Such discontinuity suggests the use of an hypothesis-testing approach. While incorrect hypotheses are being considered and discarded, there is no improvement in performance; at the point where the correct hypothesis occurs, improvement takes place. In contrast, the learning curves for field-dependent subjects showed gradual improvement in performance from trial to trial, an outcome to be expected from the use of a spectator approach to the concept-attainment task.

It is important to point out that effective learning may take place by either an hypothesis-testing or a spectator approach. Thus, in the data of Nebelkopf and Dreyer there was no significant difference between field-dependent and field-independent subjects in number of trials required to attain the correct concept. Here, as in many other circumstances, field-dependence-independence appears to be more related to the "how" than to the "how much" of cognitive functioning.

It is also important to emphasize that the tendency of field-dependent persons to favor a spectator over an hypothesis-testing approach is found under conditions where both options

involve interpersonal relations in varying degree, they tend to go with field independence. Field-independent persons also show interest in practical domains, such as production manager, carpenter, forest service, farmer, mechanic (for example, Gehlmann, 1951; Levy, 1969; Pierson, 1965), and they give clear evidence of theoretical interests (for example, Adcock & Webberley, 1971; Pemberton, 1952). There is finally a result for which we did not have an advance hypothesis but which is worth noting because it has appeared in a number of studies: field independence is associated with artistic interest (for example, Clar, 1971; Crutchfield et al., 1958).

In contrast with the preponderant interest of field-independent persons in the analytical-impersonal domains listed above, field-dependent persons express interest in interpersonal domains that particularly require social skills. One cluster of interests they frequently express falls in the welfare-helping-humanitarian domain, including social worker, minister, rehabilitation counselor, probation officer. Another is the teaching of social sciences, elementary-school teaching, and business administration. It is noteworthy that the teaching and health-profession areas we find here on the field-dependent side do not involve analytical competence, in contrast to their teaching and health-profession counterparts found on the field-independent side, although all these occupations involve interpersonal relations to some degree. Other vocational interests frequently expressed by field-dependent persons fall into the "persuasive-activities" domains (selling, advertising) and administrative activities which involve dealing with people (for example, personnel director, community recreation administrator, YMCA public administrator, city school superintendent, and chamber of commerce director).<sup>12</sup>

With the view that the analytical-nonanalytical and impersonal-interpersonal dimensions best distinguish the expressed interests of relatively field-dependent and field-independent persons, Clar (1971) applied these dimensions to the data from her study of the Strong Interest Inventory responses

<sup>12</sup> It is of interest that field-dependent persons may be drawn to occupations which place them in a position of leadership. The association of interests in social leadership with field dependence and, as we just saw, of "practical" interests (such as mechanic, farmer, carpenter, forest serviceman) with field independence, suggests that the conventional social-status values of occupations do not, in any simple way, distinguish the interests of relatively field-dependent and field-independent persons. As we shall see, this is also true of educational-vocational choices. Thus, academic majors such as the humanities and sociology, which tend to be favored by relatively field-dependent students, are not easily classified as having greater or less status than the sciences, favored by field-independent students.

As we turn to an examination of the evidence on the role of cognitive style in specific facets of career differentiation, it is important to emphasize again that when using cognitive style to predict behavior, we are able to rest our predictions on a *cluster* of characteristics subsumed by that style. Within that cluster, some characteristics may be highly relevant to a particular educational-vocational domain and other characteristics not particularly relevant.

### *Educational-Vocational Interests*

The results of the very large number of studies that have examined the relation of educational-vocational interests and attitudes to field-dependence-independence present a picture that, by and large, is in keeping with expectations (for example, Arbuthnot & Gruenfeld, 1969; Chung, 1967; Crutchfield et al., 1958; Keen, 1974; Pemberton, 1952; Scheibner, 1970; Zytowski, Mills, & Paepe, 1969). As a general principle, relatively field-independent persons, taken as a group, are likely to show interest in domains where their cognitive skill—competence in articulation or in analysis and structuring—are called for and where relations with people are not particularly involved. In contrast, relatively field-dependent persons, as a group, are likely to favor domains with a “people” emphasis—that is, which feature social content and which involve interpersonal relations in daily ongoing activities—and for which analytical/structuring competence does not particularly matter. This pattern has emerged with a fair degree of regularity in the studies done to date on educational-vocational preferences, though there are exceptions. We review now some of the findings which illustrate these generalizations.

Since most of the studies used the Strong Vocational Interest Blank, or similar instruments, the relationships that have been reported are almost entirely between cognitive style and interests defined in vocational terms.

It has been found repeatedly that the responses of more field-independent people to standard interest inventories are consistent with those of people in the mathematics and science domains—as, for example, mathematician, physicist, chemist, biologist, architect, engineer—and of such health professionals as physician, dentist, psychiatrist. In some studies field-independent persons have also shown interest in the teaching of mathematics-science, industrial-arts and vocational-agricultural subjects. These teaching areas, as well as the health-profession areas cited, all require analytical/structuring competence (for psychiatrists, perhaps more during their training than during their medical practice), and, although these areas may also



are available. In most concept-attainment studies, however, the subject is implicitly directed to an hypothesis-testing approach. This is done, for example, by giving the subject a set of hypotheses from which the concept is to be drawn or by asking the subject to attempt to identify the concept after each trial. When encouraged by these methods to learn concepts through an hypothesis-testing approach, field-dependent subjects are able to do so. As we shall see in the next section, however, when they do use an hypothesis-testing approach they seem to form hypotheses on a different basis than do field-independent persons.

The evidence we have reviewed suggests that their lesser use of structuring as a mediator may handicap field-dependent students in unstructured learning situations. There are probably many classroom situations where, because the material to be learned is not clearly organized, the field-dependent student may be at a disadvantage. Field-dependent students may need more explicit instruction in problem-solving strategies or more exact definition of performance outcomes than field-independent students, who may even perform better when allowed to develop their own strategies. Attention to cognitive-style differences in learning under more structured and less structured conditions, and detailed analysis of the problem-solving skills and strategies assumed for different learning tasks, are necessary.

#### *Cue Salience*

It is clear that, in the formation of hypotheses about the nature of the concepts to be learned, noticeable cues are, in general, more likely to be used than cues that are not very noticeable (for example, Bruner et al., 1956). It is equally clear that concepts defined in terms of more salient cues are generally easier to learn than concepts defined in terms of less salient cues. Now field-dependent persons, as we have seen, are particularly responsive to the dominant arrangement of the field as given and are not very likely to depart from that arrangement. On this basis, we may expect the effects of cue salience to be more pronounced for field-dependent than field-independent concept learners. A variety of evidence is consistent with this expectation.

In the typical concept-attainment problem the subject is presented with a series of complex stimuli, some of which are exemplars and others nonexemplars of the concept to be learned. For each stimulus the subject guesses whether it is an exemplar and is then told by the experimenter whether his guess is correct or not. This procedure continues until the subject reaches some criterion of success in his guesses. It has been shown in several studies that in this kind of task field-dependent learners, in

constructing their guesses, tend to ignore some (presumably nonsalient) attributes. In contrast, field-independent learners tend to sample more fully from the array of cues objectively available for concept definition (Dickstein, 1968; Kirschenbaum, 1969; Shapson, 1973). In view of this difference in cue-sampling behavior, it might be expected that field-independent people would learn concepts more rapidly when the salient cue is irrelevant to the definition of the concept. The evidence from many studies is consistent with this expectation (Goodenough, 1976). The case in which the relevant cues are salient is particularly interesting, because of the possibility that field-dependent people may learn more rapidly than field-independent people under such circumstances. The evidence on this point is scanty, but a few studies in which field-dependent subjects tended to learn concepts more rapidly than field-independent subjects may have involved relevant cues which were salient (Ruble & Nakamura, 1972; Zavel, 1970).

If certain cues have a history of relevance in the experience of the learner, their salience may be enhanced. Correspondingly, cues which are nonrelevant to the learner's experience may become less salient. One may therefore expect that field-dependent people would have particular learning difficulties under conditions in which cues useful for one concept definition become irrelevant in the context of a new learning problem. The evidence suggests that field-dependent people do indeed have difficulty breaking learning sets of this sort (Ohnmacht, 1966; Zavel, 1970).

The relationship between field-dependence-independence and concept attainment is of particular concern to educators because of their interest in having students learn concepts, rather than facts alone. It is therefore natural to ask how field-dependent students may be aided to overcome their domination by salient cues. There are some suggestions in the experimental literature as to the aids to cue usability that may be effective in teaching concepts to field-dependent learners (Shapson, 1973). Reports of attempts to develop such aids for application in classroom settings are beginning to appear in the literature but these attempts have not yet been successful (Dickie, 1970; Grippin, 1973; Nelson, 1973).

We have noted that cognitive styles tend to be stable over time. However, many behaviors that emanate from cognitive styles are far more malleable. Thus, as we have seen, although field-dependent persons tend to favor a spectator approach to concept attainment and field-independent persons an hypothesis-testing approach, it seems easily possible to induce field-dependent persons to use an hypothesis-testing approach by as simple a

students are clearly not particularly different in how they come through college on an overall achievement measure such as grade-point average. However, as we shall see, they are likely to be different in the mix of courses they select in which the essentially same grade-point averages are earned (Witkin, Moore, Oltman, Goodenough, Friedman, & Owen, Note 10).

The evidence we draw upon in examining the role of cognitive style in career differentiation comes primarily from the literature that has accumulated over the past few years. Supplementing that evidence are the results now emerging from our own longitudinal study, just cited. The population of that study was the entire class of approximately 1600 students from a large municipal college. On entering in 1967, these students were assessed for cognitive style, and we were able to obtain their full high-school transcripts, their SAT scores, and other kinds of information about them. Four years later we obtained the complete college transcripts of those who made it through to graduation. Those in the class who went on to graduate or professional schools were identified, and information obtained about their movement into postgraduate work. This study thus provides an opportunity to pursue the implications of an individual's cognitive style for various facets of his academic development over a 12-year period: through high school, college and graduate/professional school. It is an obvious advantage of the longitudinal design of this study, over cross-sectional studies, that it allows us to trace the long-range academic evolution of the same students.

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college grade-point average was .37 for women ( $p < .001, N = 633$ ) and .33 for men ( $p < .001, N = 583$ ). In two other studies, verbal SAT scores significantly predicted college grade-point averages, while measures of field-dependence-independence did not (Pohl, 1967; Stein, 1968). In a fourth study, ETS Cooperative English Test scores also significantly predicted grade-point average, but field-dependence-independence measures did not (Glass, 1967).

<sup>11</sup> There seems to be somewhat more of a relationship, though not a strong one, between field-dependence-independence and grade-point average at the high-school level (for example, Acker, 1968; Cline, Richards, & Abe, 1962; Mayer, 1967; Quinlan, 1971) and a rather definite relation at the elementary school level (for example, Cropley, 1966; Erginel, 1970; Frederick, 1967; Wagner, 1974). The difference between the elementary school and college levels may be connected with the difference between the usually compulsory curriculum at the elementary school level and the elective curriculum at the college level. To the extent that an elective system allows students to gravitate toward courses compatible with their cognitive styles, and to the extent that students, as we shall see, tend to do well in courses they have thus selected, there is less likely to be a relation between cognitive style and achievement in an elective setting. In a nonelective curriculum, field-dependent students are likely to be penalized in that part of the curriculum which calls for analytic skills, such as mathematical and scientific subjects. On the other hand, field-independent students are not as likely to be penalized in the social sciences domain because courses in that domain are, as we shall suggest later, often "broad-gauge" disciplines.

Teachers' adaptation will be a realizable goal if we are able to identify particular teaching strategies which teachers may use, either spontaneously or with training, when teaching students with different cognitive styles.

### *Career Differentiation*

There is now a growing body of evidence on the role of cognitive style in career differentiation. One reason for the increasing interest in this issue is that, particularly because of their bipolar nature, cognitive styles provide an alternative to the usual abilities approach to career differentiation. The complementary use of information about abilities and cognitive styles seems likely to provide a rich and broad basis for making career decisions.

Precisely because of their bipolar nature, cognitive styles are, generally speaking, more useful in guidance than in selection. Admissions committees, faced with the task of selecting groups as heterogeneous as a college class, seek measures which can be used to separate those more likely to make it through college from those less likely to make it. For such general-purpose efforts, bipolar dimensions, such as cognitive styles, are not particularly useful. Cognitive styles, as we have seen, emphasize the ways in which persons towards one pole or the other are different with regard to the settings in which they can best function. One circumstance in which cognitive styles may prove useful in selection, however, is where candidates are being chosen for a rather specialized situation, which specifically calls for the attributes found towards one pole or the other of the style.

Consistent with the ideas that general-purpose selection, as in composing an entering college class, is not "where it is at" for cognitive styles is the repeated finding that measures of field-dependence-independence bear little relation to college grade-point average. This relation has been examined in a number of studies conducted in a liberal arts college setting, and, with only rare exceptions, the correlations obtained were not significant (for example, Anderson, 1972; Gehlmann, 1951; Glass, 1967; Montgomery, 1972; Pohl, 1967).<sup>9</sup> The largest of these studies, a longitudinal one we ourselves are conducting with a sample of college students, yielded correlations of only .08 for men ( $N = 583$ ) and .05 for women ( $N = 633$ ) between measures of field-dependence-independence and four-year college grade-point averages.<sup>10,11</sup> Relatively field-dependent and field-independent

<sup>9</sup> In one study (Baker, 1971), no relation was found at the graduate-school level.

<sup>10</sup> Verbal ability, in contrast, does appear to relate to college grade-point average. Thus, in our longitudinal study the correlation of verbal SAT scores with

means as providing directions to use such an approach. We have also seen that when using an hypothesis-testing approach field-dependent persons may be more strongly guided by salient features of the stimulus array than field-independent persons, who sample the array more extensively. Here again there is some suggestion, though hardly yet proof, that field-dependent persons may be helped in overcoming their tendency to adhere to what is salient.

The case seems well documented that relatively field-dependent and field-independent persons tend to favor different learning approaches. The approaches favored by the one kind of person do not necessarily make for better achievement than the approaches favored by the other kind. Whether one approach will lead to a better learning outcome than others seems to depend rather on the specific characteristics of the learning tasks and the particular circumstances under which learning takes place. It is not unreasonable to expect that as teachers become more aware of the ways in which relatively field-dependent and field-independent students learn concepts, they may become more effective in adapting instructional procedures to the needs of these different kinds of students. Beyond encouraging teachers to adapt their teaching to students as they find them, we may hope even more that teachers may find ways of helping students diversify their learning strategies. The apparent malleability of learning strategies flowing from cognitive styles gives some encouragement to this hope.

#### *How Teachers Teach*

Research on the role of teachers' cognitive styles in their approach to teaching has, for the most part, used the social-versus-impersonal orientation and sense-of-separate identity aspects of the articulated-global dimension as points of departure for investigating classroom behavior of teachers with contrasting styles. The characteristics relevant to the teaching situation which stem from a more social or more impersonal orientation include extent of interest in interaction with others and in more social or more abstract curriculum content. The characteristic most relevant to teaching which stems from sense of separate identity is the extent to which the teacher is likely to assume responsibility for directing the teaching situation or to share this responsibility with students. Studies of teachers' preferences and of teachers' behavior in simulated teaching situations provide evidence of the expected differences in these characteristics between more field-dependent and field-independent teachers.

This evidence indicates, first of all, that whereas relatively

field-dependent teachers favor teaching situations that allow interaction with students, more field-independent teachers prefer teaching situations that are impersonal in nature and oriented toward the more cognitive aspects of teaching. As one finding, class discussion has been judged by more field-dependent teachers to represent better teaching and to be more effective for learning. A discussion approach, it should be noted, not only emphasizes social interaction, but it also gives the students more of a role in structuring the classroom situation. Wu (1968), for example, found that more field-dependent student teachers in social studies ranked discussion as more important to the practice of good teaching than either lecture or discovery approaches, which were favored by more field-independent teachers. Both lecture and discovery approaches reserve to the teacher much of the organization of the learning situation, either through facilitating and guiding student learning or through providing information.

Results from a recent study by Moore (1973) of patterns of verbal teaching behavior may perhaps also be seen as bearing on the issue of teacher directiveness. Moore used a simulation game devised to investigate differences in teachers' use of rules, relations and examples in explaining chemistry subject matter and questioning students on the content. The results suggest that the more field-independent teachers tended to use questions as instructional tools more frequently than the field-dependent teachers. Field-independent teachers tended to use questions in introducing topics and following student answers, whereas the more field-dependent teachers used questions primarily to check on student learning following instruction. Since verbal intervention was restricted and student responses very limited, discovery or discussion techniques could not be employed by the teachers. The kind of questioning approach used by the more field-independent group may be seen as the main avenue for teachers to attempt translation of a discovery approach within the context of the game.

Additional data on teacher roles were obtained by Emmerich in our study of the role of cognitive style in the teaching-learning process mentioned earlier. After teaching students in the minicourse, experienced social studies teachers who were field dependent reported feeling that class discussion was an effective technique for enhancing the learning of students. Particularly indicative of the field-dependent teachers' effort to involve students in organizing the content and sequences of the teaching-learning process is Emmerich's additional finding that field-dependent teachers (but not field-independent ones) felt encouragement of students to set up a group standard to be a useful

ity" in the more field-independent teacher's tendency to provide feedback and the field-dependent child's benefit from feedback as a source of structuring. The possibilities that have been listed reflect the complexity of the relation between cognitive style match-mismatch and student achievement, and they provide a strong note of caution against deciding about the desirability of matching before a great deal more is known as to the consequences of matching for student learning. An added note of caution is suggested by the obvious practical problems likely to be encountered in attempting to create classes of students homogenous in cognitive style and matched in style with their teacher.

As a second question, we need to find out how match or mismatch in cognitive style works to produce the effects observed. For this purpose, a microscopic examination needs to be made of the processes of teacher-student interaction which lead to a more positive outcome in interpersonal attraction (and perhaps in better learning) with match than with mismatch.

A third question that needs to be answered concerns the role of situational variables in moderating the effects of match or mismatch in cognitive style. The operation of such moderator variables has recently been demonstrated by Oltman et al. (1975) in a study of conflict resolution. It is not difficult to think of variables specific to the classroom situation which may modify the effects of teacher-student cognitive style match-mismatch effects. As one example, just noted, in our study of cognitive style in the teaching-learning process, match or mismatch in sex of student and teacher had such a potent effect on mutual attraction for the high-school-age population we used as to obscure the effects of cognitive-style match-mismatch. Another classroom variable that could modify cognitive-style match-mismatch effects is course curriculum. In areas where good student performance requires highly specialized skills, the availability of these skills may overwhelm cognitive-style match-mismatch effects.

In using studies of cognitive-style match-mismatch effects as a route to understanding what goes on in the classroom, it is the teacher-student interaction process which is made the focus of inquiry; at the same time, account is taken of individuality and diversity of teachers and of students. The broad approach they follow is likely to make teacher-student match-mismatch studies informative about the classroom situation, whatever their ultimate implications for placement of teachers and students. One practical use of knowledge about the effects of teachers' and students' cognitive styles, studied in interaction, may be to provide teachers with information on how to adapt their teaching strategies to match the learning needs of dissimilar students.

match-mismatch phenomenon exists is to have opened the door only a crack. What is already visible through that crack suggests, however, that we may find much of interest behind it for the teaching-learning process. There are many basic questions to be answered before we can even begin to consider the practical implications of the match-mismatch phenomenon for the classroom situation. These questions, fortunately, are all answerable by research.

The first and foremost question is whether matching for cognitive style makes for better student learning, and not alone for the greater interpersonal attraction that has been demonstrated to this point.<sup>8</sup> On the one hand, it is possible to see ways in which teacher-student match may have a positive learning outcome. For example, it may well be that the greater interpersonal attraction between teachers and students matched in cognitive style creates a classroom atmosphere conducive to learning. Also congenial to each other are the tendency of field-independent teachers to encourage the application of principles and of field-independent students to favor the theoretical and abstract, and, correspondingly, of field-dependent teachers and students to favor material that is informational in content. Again, the field-dependent teacher's preference for classroom discussion may provide the kind of social context suited to the personal needs of field-dependent children. On the other hand, it is equally possible to conceive of negative consequences of matching. As one example, it may be that for some kinds of learning content a contrast in styles between teacher and student may be more stimulating than similarity. In general, because heterogeneity makes for diversity in viewpoints and responses, it may serve to make the classroom more lively; if so, homogeneous classes may be ill-advised. As another example, while the interpersonal effects of the discussion approach used by relatively field-dependent teachers may be helpful to learning by field-dependent students, that very approach at the same time minimizes structure from the teacher which field-dependent students seem to need for most effective learning. As still another example, we have seen that relatively field-independent teachers are likely to use negative reinforcement in the classroom, but it is the more field-dependent student who is particularly responsive to this technique, although, depending on circumstances, its effect on learning may be positive or negative. There is a similar "dispar-

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<sup>8</sup> The study by Folman (1973) has shown that match in cognitive style may lead to patient improvement, as well as to greater patient-therapist interpersonal attraction. Folman found that patient dropout rate, a commonly used achievement criterion in therapy studies, was lower for patients from matched than from mismatched patient-therapist dyads.



teaching practice. Correspondingly, teachers' statements about effective teaching techniques suggest that the field-dependent teachers were more student-centered in their approach. In contrast, students reported that field-independent teachers more frequently emphasized teachers' standards.

Another finding of Emmerich's, on teachers' preferences for different kinds of reinforcement, also seems consistent with expectations on teacher directiveness. Field-independent teachers, but not field-dependent ones, felt that informing the student when a response was incorrect and, in addition, telling him why it was incorrect, was effective in enhancing student learning. Obviously, corrective feedback provides the student with information for improving his own performance. In their use of such feedback, field-independent teachers may be seen as using a teaching approach in which they themselves organize and guide student learning. Field-independent teachers also described themselves as considering negative evaluation (that is, expression of displeasure when a student performed below capacity) to be an effective teaching technique. That both corrective feedback and negative evaluation, which involve making critical comments about another person, should be emphasized by field-independent, but not by field-dependent teachers, is consistent with the evidence from several recent studies that field-dependent persons are less likely to express (and perhaps even to feel) hostility toward other persons than field-independent persons (Bogo, Winget, & Gleser, 1970; Greenfield, 1969; Ihilevich & Gleser, 1971; Witkin, Lewis, & Weil, 1968). This difference has been interpreted in terms of the greater sense of separate identity of field-independent people (Witkin, Lewis, & Weil, 1968); the field-dependent person's greater reliance on others for self-definition makes it a problem for him to antagonize others.

Probably also reflecting the greater interest of field-independent people in the abstract and theoretical, as well as in structuring, is Emmerich's finding that students of field-independent teachers perceived these teachers as encouraging students to apply principles; in contrast, field-dependent teachers were more often seen as teaching facts.

The differences observed in preferred teaching techniques and in teaching under simulated teaching conditions suggest that field-dependent and field-independent teachers may conduct their classes differently and show different patterns of actual teaching behavior in the classroom. So far, only two studies of classroom teaching behavior, in relation to field-dependence-independence of teachers, have been reported. These studies are, however, too limited in the teaching variables explored to be informative about teaching differences. In the first study, En-

gelhardt (1973) employed Hall's observation schedule (Instrument for Analysis of Science Teaching) to observe elementary school student teachers in a minicourse setting. No relation was found between field-dependence-independence and intensity of teaching, style of teaching (student-centered or teacher-centered), or consistency of teaching style. Unfortunately, only results relating to these summary teaching variables are reported, leaving open the possibility that teachers of differing cognitive style may have differed in more specific teaching behavior. In the second study, Ohnmacht (1967a) also found no relation between field-dependence-independence and direct or indirect teaching, as defined by Flanders Interaction Analysis summary scores. Again, the relation of cognitive style to particular types of teaching behavior (for example, praise, criticism, use of student ideas, questioning, lecturing) is not reported. In addition, the research by Ohnmacht (1967b, 1968) suggesting that field-dependent, high-dogmatic men may be less stimulating and imaginative in their teaching than other teachers was not supported when classroom data from Flanders Interaction Analysis scale were considered (Ohnmacht, Note 7). In summary, then, little is yet known about differences in actual classroom teaching behavior of more field-dependent and more field-independent teachers.

Clearly, work is needed to determine whether the differences in teaching preferences and in teaching behavior between relatively field-dependent and field-independent teachers, observed under the special research conditions of the studies reviewed, are representative of cognitive-style differences in actual classroom teaching. Beyond that, there is the large research task of examining in more detail the relations that have been identified in order to determine the processes underlying these relations. In addition, implications of cognitive styles for aspects of teaching to which they have not yet been applied need to be pursued. One example is the way in which tendencies toward a more articulated or more global way of processing information enters into teachers' construction both of their communications to students and their responses to students' communications.

Several principles suggested by the evidence reviewed here, and by other evidence, are worth keeping in view in considering further lines of research.

First, whatever differences there may be between teachers of contrasting cognitive styles, such teachers do not seem to differ in sheer teaching competence. Taking student achievement as the product of the teacher's teaching efforts, students of field-dependent and field-independent teachers in our study of cognitive style in the teaching-learning process were not significantly

feelings in patients. One basis is shared interests. It is not difficult to see, for example, how the social orientation of field-dependent persons and the impersonal orientation of field-independent persons could cause matched pairs, when they come together, to focus quite spontaneously on the same aspects of a situation at issue, thereby heightening the facility and enjoyment of their interaction. A second possible basis for greater interpersonal attraction between individuals of similar cognitive style may lie in their shared personality characteristics (for example, Witkin et al., 1954/1972; Witkin et al., 1962/1974). Thus, the defenses favored by relatively field-dependent persons and relatively field-independent persons are likely to make for similarity, and hence congeniality, among persons of each kind in mode of impulse expression and in responses to feelings displayed by others. A third possible basis for the greater interpersonal attraction observed between persons matched in cognitive style may lie in similarity in modes of communication (for example, Doob, 1958; Freedman, O'Hanlon, Oltman, & Witkin, 1972; Jennings, 1968; Marcus, 1970; Shows, 1968; Luborsky, Note 9). That similarity in communication modes deriving from cognitive style may facilitate understanding is suggested by the results of a study by Shows (1968). In that study two verbal descriptions of a series of pictures were prepared consisting of adjectives selected by a group of judges as likely to be employed by field-dependent and field-independent persons. Subjects did significantly better in matching verbal description to picture with descriptions prepared as corresponding to their cognitive style. It seems plausible that interaction between people should proceed more smoothly, and mutual feelings between them should be more positive, when, as a function of similarity in style, they share the same interests, have common personality attributes, and use similar communication modes.

It is impressive that in some of the studies cited interpersonal-attraction effects were observed after short periods of interaction. Evidence of such effects might have been found even earlier in the interaction process had it been sought. It is also impressive that people not knowledgeable about cognitive styles, and naive with respect to the particular styles of those with whom they are interacting, should respond quite naturally, and with apparent ease, to cues about other people's field dependence or field independence. Evidently, some behaviors associated with these cognitive styles are salient and obvious to all.

The evidence now on hand has established match or mismatch in cognitive styles as a factor in teacher-student and other kinds of social interaction as well. To have demonstrated that a

may apply here as well; teachers may indeed do better with students similar to themselves in cognitive style, and students may learn more effectively when taught by teachers matched to them in cognitive style.

The third study of teacher-student cognitive style match-mismatch effects is one, already mentioned, we ourselves conducted in collaboration with Walter Emmerich, Philip Oltman, and Frederick McDonald. For that study a four-session minicourse was organized, using a curriculum designed to allow expression of likely subject-matter and teaching-technique preferences of field-dependent and field-independent teachers and subject-matter and learning-strategy preferences of field-dependent and field-independent students. Each of 24 teachers (12 men and 12 women, six of each sex field dependent and six field independent) taught this minicourse. Each class consisted of four 14- to 15-year-old students, two boys and two girls, one student of each sex field dependent, the other field independent. Teacher and student responses to postcourse interpersonal attraction questionnaires did not show the expected teacher-student cognitive-style match-mismatch effect. Instead, a teacher-student sex match-mismatch effect was observed. With these adolescent students, it was found that teachers and students of the same sex valued each other more highly than teachers and students of the opposite sex. Apparently, the sex match-mismatch effect was more potent and took precedence over the cognitive-style match-mismatch effect. It should be noted that while the design of our study allowed a sex match-mismatch effect to occur, the DiStefano and James studies did not: DiStefano used male teachers and male students, and James used male teachers and female students.

Though up to this point there have been only these three studies of teacher-student match-mismatch effects, cognitive style match-mismatch effects have been observed in other social-interaction contexts—in patient-therapist interactions (Folman, 1973; Greene, 1972) and in peer interaction (Welkowitz, Note 8)—although it was not found in a study of client-counselor interaction (Dingman, 1972).

The studies cited, together, suggest that cognitive-style match-mismatch effects on interpersonal attraction are generally to be found in social interactions where participants are working together toward a common goal.

Several bases are suggested by the literature on field-dependence-independence for the tendency of persons matched in cognitive style to like each other better and, perhaps, to make greater progress in achieving the goal of the interaction, whether that goal is better learning by students or improved

different in their total post minicourse test scores. Neither were the students different in their overall scores on a test of expressed interest in the subject matter of the course at the course's end. The differences between field-dependent and field-independent teachers seem to lie rather in their approach to the teaching situation, the consequences of which are not likely to be detected in gross student achievement indices. For example, through a discussion approach which their social orientation seems likely to favor, field-dependent teachers can employ personal conversational techniques to engage students in a learning situation and to develop rapport with students. Class discussion is also likely to give students more of a sense of participation in setting standards and goals and influencing coverage of class material. Through the use of such approaches, field-dependent teachers may show strength in establishing a warm and personal learning environment. In contrast, because of their particular cognitive and personal characteristics, field-independent teachers may show strength in the organization and guidance of student learning. These observations inevitably bring to mind the question of the compatibility of these different teaching strengths with the needs of different kinds of students. This is a question we consider in the next section.

If future research demonstrates differences in teaching approaches in the classroom itself, related to differences in teachers' cognitive styles, the question will then arise whether teachers are able to adopt teaching approaches, other than those fostered by their cognitive styles, in order better to meet the needs of a particular student. This issue of teacher adaptation has not yet been investigated, but some evidence from research on therapy (Witkin, Lewis, & Weil, 1968) suggests that this line of research may be a fruitful one. While frequency of therapist interactions tended to relate to therapist cognitive style in that study, it was also found that therapists intervened significantly more often with their field-dependent than their field-independent patients. We now understand this difference to be due to therapists' adaptation to differences in their patients' need for structuring, following from differences in patients' cognitive styles. An analysis of therapists' utterances, not included in the published report of the study, showed that each therapist, whatever his own cognitive style, asked more specific questions, answerable by "yes" or "no," of his field-dependent than his field-independent patient, and more open-ended questions of his field-independent than field-dependent patient. The patient's options in answering the first kind of question are minimal and clear-cut, so structuring of responses is not particularly required. This makes such questions appropriate to the

field-dependent patient's lesser use of structuring. In contrast, open-ended questions, by leaving more options to the patient, and so requiring the patient to take more responsibility for structuring his responses, seem appropriate to the cognitive makeup of field-independent patients. It is noteworthy that, whatever cues they used, therapists proved able in the very first session of therapy to identify the needs of their patients, stemming from the patients' cognitive styles, and to adapt the form of their questions accordingly.

Another example of the ability of therapists to make adjustments to the cognitive styles of their patients comes from the finding that therapists more often favor supportive forms of therapy for their field-dependent patients and modifying forms of therapy for their more differentiated patients, as noted earlier. Considering the modes of interaction involved in these two therapeutic approaches, it seems that therapists, very early in their encounters with their patients, choose to enter into quite different sorts of interpersonal relations with these two kinds of people.

We may wonder whether teachers show similar adaptation to their students' needs. We may wonder as well whether there are individual differences among teachers in the ease with which they are able to determine that a shift from the teaching approach fostered by their cognitive styles is required and then to make the shift. And we may ask as well whether, by sensitizing teachers to the implications of their own cognitive styles and the styles of their students for the teaching-learning process, we may increase the adaptability of teachers, so they become more diversified in the teaching approaches they use. The evidence considered earlier that people can rather easily be made to use learning approaches other than those fostered by their cognitive styles makes it plausible to believe that, with appropriate training methods, teaching approaches may also be diversified.

#### *How Teachers and Students Interact*

In the studies reviewed to this point the role of students' cognitive styles in their learning behavior and of teachers' cognitive styles in their teaching behavior have been considered apart from each other. For the classroom, where teachers and students are engaged in a continuous, interactive dialogue, which constitutes the integral teaching-learning process, studies of the combinatory effects of the cognitive styles of both contributors to this process are likely to be even more informative. The full contribution of cognitive style to any social interaction is more than the sum of the effects of each participant's style.

Interactions acquire unique properties which are emergents of the particular combination of characteristics of the individuals involved. This principle has been shown to operate in the case of cognitive styles. To date studies of the combinatory effects of cognitive styles have focused mainly on the progress and outcome of an interaction when its participants are matched or mismatched in cognitive style. The match-mismatch issue has been examined in three studies of teacher-student interaction.

DiStefano (1970) used as subjects teachers and students in a regular classroom situation. He found that, in their responses to several questionnaires, teachers and students matched to each other in style viewed one another positively, whereas teachers and students who were mismatched viewed each other negatively. It is noteworthy that the positive and negative evaluations included not only personal characteristics but cognitive characteristics as well. In another study, James (1973) used a specially created minicourse in which each teacher taught a class of three field-dependent and three field-independent students. Responses to questionnaires similar to those used by DiStefano confirmed DiStefano's finding of significantly greater interpersonal attraction in matched than in mismatched teacher-student combination. In addition to obtaining questionnaire data, James asked each teacher, at the end of the course (but prior to the final examination), to assign grades to his six students on the basis of their classroom performance. The most extremely field-independent teacher gave all three of his field-independent students higher grades than the three field-dependent students. Conversely, the most extremely field-dependent teacher assigned the three highest grades to his three field-dependent students.

Since the grades assigned by teachers in the James study were based on classroom impressions, they undoubtedly reflect, in some degree, the effects of interpersonal attraction. In the DiStefano study, the questionnaires used for student evaluations focused even more directly on the teachers' attitudes and feelings toward the student. It thus seems reasonable to interpret both the DiStefano and James findings as demonstrating that teacher-student match in cognitive style makes for greater interpersonal attraction than mismatch. It is also possible that teachers' higher evaluation of students similar to them in cognitive style may have reflected better student performance, but since only teacher estimates of student achievement were available in these studies, this possibility has not been clearly demonstrated. Yet, it is a possibility that seems quite reasonable. The concept, made plausible by common sense and experience, that particular teachers do better with some students than others,